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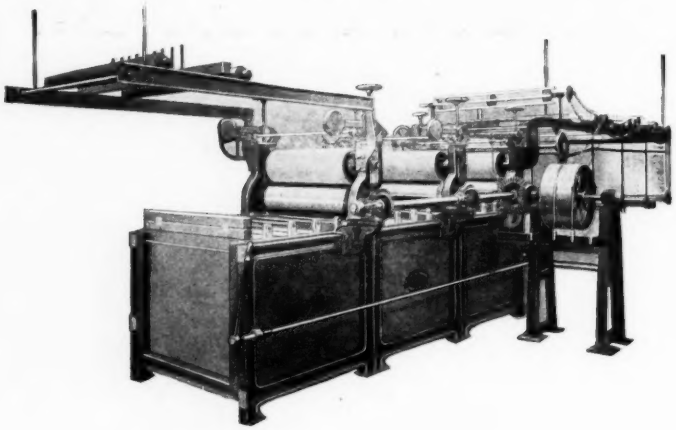

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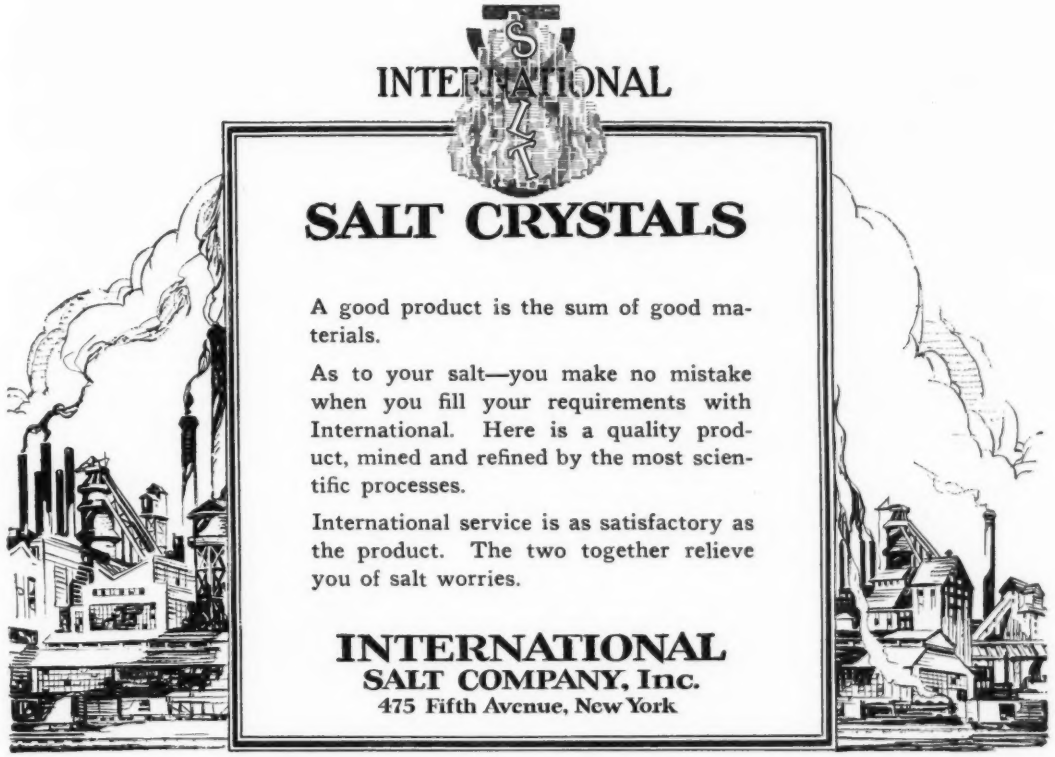
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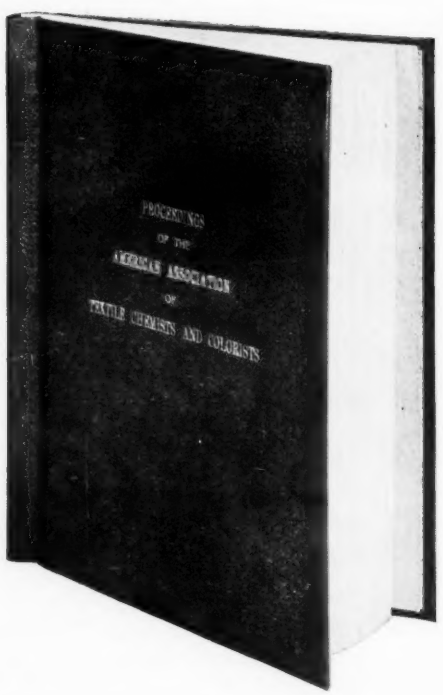

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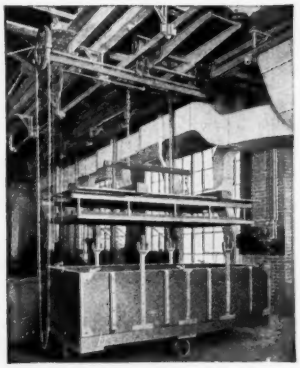

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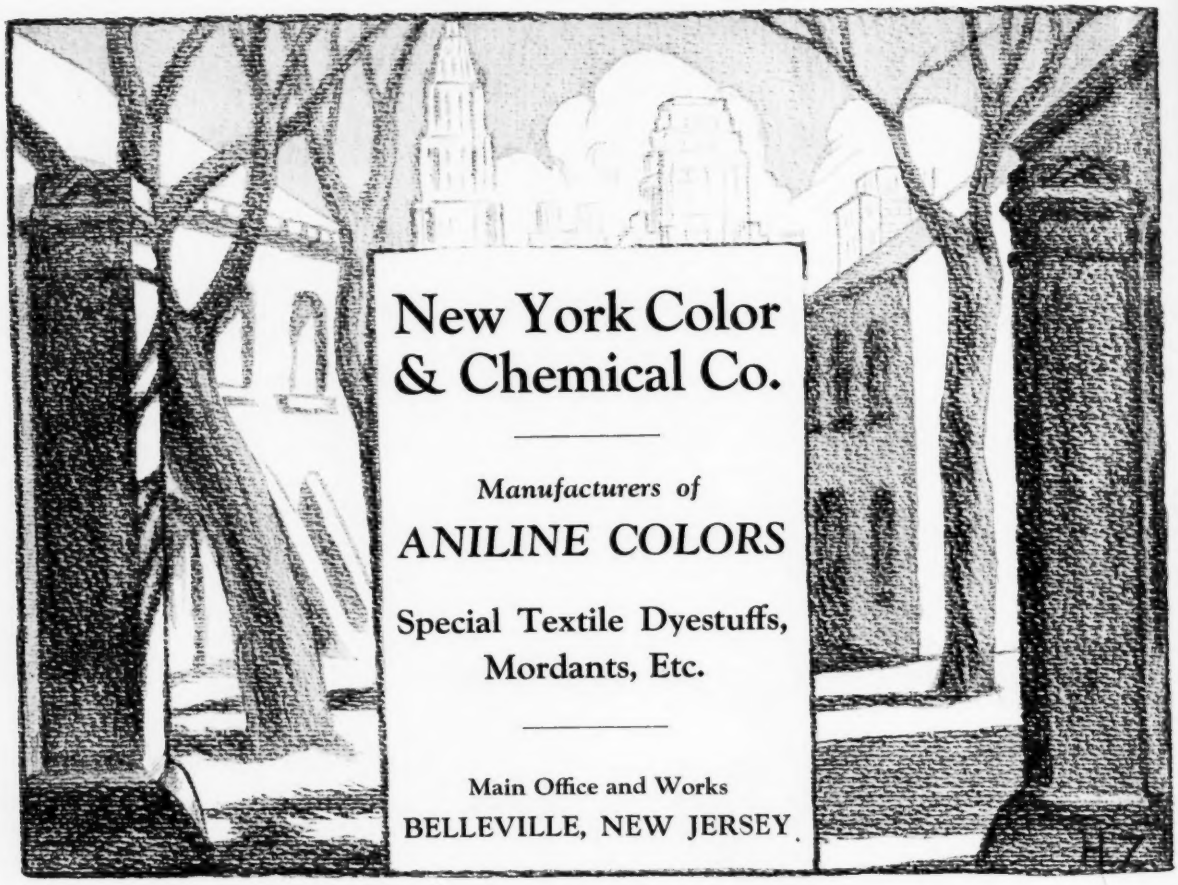

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VOLUME XV NEW YORK, NOVEMBER 1, 1926 NUMBER 18

Textile Oils Applicable in the Dyeing and Finishing of Cotton

Turkey Red Oil—Its Manufacture and Uses—Mordanting of Turkey Reds on Cotton—Function of Turkey Red Oil in Calico Printing—Employment with Basic Colors—With Direct Colors—With Developed Colors—Use with Sulphur and Acid Colors—In Lake and Paper Industries—Soluble Oils and Softeners—Soap Softeners—Emulsion Softeners

By FRANK E. BURNHAM

THE uses of oils in the textile industry are as varied as they are important. The different processes of carding, spinning, dyeing, printing, softening and finishing textiles all require the use of oils, and upon the selection of the proper oil the success of these operations largely depends. In this article it is proposed to describe the nature of some of the important textile oils, and the purposes for which they are the best adapted. Occasion will be taken, where necessary, to correct some of the erroneous conceptions on the subject that still prevail here and there in the trade.

Turkey Red Oil

Turkey Red oil and Monopole oil which are similar in properties and methods of manufacture, are known chemically as the alkali salts of ricinoleo sulphuric acid, and are manufactured by treating commercial castor oil with concentrated sulphuric acid at a moderate temperature. Centuries ago Turkey Reds were dyed on cotton cloth and yarn with madder, oils and alums, and this process was in use until about 1868, when Graebe and Lieberman produced the first artificial Alizarine Red dyestuff on a commercial scale. About this time, also, John Mercer perfected Turkey Red oil in his old print works known as Madder Clough at Oakenshaw, which is now a part of Clayton-le-Moors, Lancashire, England. Mercer had the distinction of dyeing on cotton the first Turkey Reds which were fast to boiling soap, and which were brighter and better than the former madder colors.

Castor oil from which Turkey Red oil is made is a pressed vegetable oil, classed as a semi-drying oil, although its constants place it nearly in the non-drying class. It has an extremely high viscosity, is soluble in alcohol, very little affected by climatic conditions, forms with metallic substances, compounds which are neither sticky nor greasy, and is in general a reliable, stable vegetable oil.

Turkey Red oil is manufactured commercially by mixing castor oil and sulphuric acid in a sulphonating kettle. This process must be very carefully performed, in order to obtain complete sulphonation without deterioriation of the valuable properties of the product. If the oil is not completely sulphonated, its solubility and emulsifying properties are diminished, and its value as a dyeing and calico printing assistant is materially lessened. If the oil is oversulphonated, or too high a temperature is maintained, a far worse result is obtained, since the oil is darkened in color, "burnt" and free fatty acids are formed by hydrolysis. Inasmuch as complete sulphonation is the most important and difficult process in the manufacture of this commodity, producers should maintain a highly efficient manufacturing and chemical department to carefully check this work by accurate control tests. After sulphonation is complete, the batch is thoroughly washed with strong brine in order to remove the excess of sulphuric acid and any foreign matter. This is an important step because free sulphuric acid even in small quantities, has a "tendering" action on textiles.

The product thus obtained is ricinoleo sulphuric acid. This is now treated with strong ammonia in order to neutralize any slight acidity and to form the ammonia compound of ricinoleo sulphuric acid commonly known as Turkey Red oil (sometimes also as Alizarine Assistant).

Turkey Red oil is a light-colored, limpid fluid, a little less viscid than castor oil. Its odor is characteristic, although not objectionable. It mixes readily with and dissolves very easily in water in any and all proportions, forming opalescent emulsions, whose clearness or transparency depends upon the degree of sulphonation and neutralization of the oil. In a neutral or slightly alkaline

condition, Turkey Red oil should stand in a 10 per cent emulsion without breaking for several hours. This is a strong indication that the oil has been properly sulphonated and neutralized and is well adapted for use in the textile industry.

Turkey Red oil is extensively used in bleaching, dyeing, calico printing and finishing. It was first used as an assistant in dyeing Turkey Reds on cotton in place of vegetable oils, and not only was a great saving of time and expense, but the resulting color was much clearer, brighter and faster. The goods also had a much better "feel" or "handle."

The process of dyeing Turkey Reds on cotton is somewhat complicated, and a special mordanting is necessary. The material is first thoroughly and carefully bleached, after which it is oiled in a slightly alkaline emulsion of Turkey Red oil in water, the oil forming about 7½ to 10 per cent of the emulsion. The material is next squeezed, dried, and aged or steamed in order to fix the oil upon the fiber. This process of oiling, drying and aging is repeated three times, when the material is steeped in water at the ordinary temperature for a short time.

The mordanting is now done by treating the material with a lukewarm solution of iron-free aluminum acetate (red liquor) or basic aluminum sulphate, which is fixed by aging or steaming. A chalk bath is next given, as this materially improves the tone and brightness of the color, and also removes any excess oil from the fiber.

The dyeing is accomplished by entering the mordanted cotton in a cold bath of Alizarine Red paste with chalk or acetate of lime. The temperature is slowly raised to about 75 deg. Cent., the material being worked until the bath is exhausted. It is of the utmost importance to avoid the presence of even traces of iron, if a clear, bright color is desired.

After dyeing, the color is a dull red, and in order to develop the brilliant shade, the goods are steamed and given a vigorous soaping and washing. The goods are then dried, finished and packed for sale.

For calico printing, the cloth is first prepared by oiling with Turkey Red oil in order that the resulting shade may be as bright and clear as possible. This is especially important when expensive goods like lawn, batiste, dimity, organdie, voile, crepe, chintz or cretonnes are being printed.

There are two "styles" of printing Turkey Red on cotton, (1) the steam or "extract style," and (2) the "madder" or "dyeing style." The following is an example of a simple "steam style" Turkey Red color paste for printing:

	Pounds
Medium starch paste	480
Thick tragacanth paste	245
Alizarine Red 20 per cent paste	130
Acetate of lime solution	25
Alumina sulphocyanide solution	100
Total	1,000

After oiling and aging the cloth is printed with the above color paste, dried, aged with ammonia vapor, and steamed between "grays," then washed, soaped at a boil, washed again and finished.

In the madder or "dyeing style" a mordant of iron-free acetate of alumina is printed on and fixed by drying and steaming or aging. The goods are next given a chalk bath to remove the excess of mordant and render the whites clear. After a thorough washing the goods are dyed Turkey Red in the usual manner, and the dyestuff is fixed only where the mordant has been printed.

In calico printing Turkey Red oil serves a twofold purpose. In the first place, it materially assists in the lake formation—very likely by forming a complex lake with the mordants and dyestuffs. This fact is strongly indicated, inasmuch as by its use the resulting lakes are much fuller, brighter and faster (especially to light and washing). In the second place, it prevents frothing in the color box, thus materially assisting in the production of firm, full, uniform shades of color, and preventing "specks" and "misses."

Turkey Red Oil can be well used with all classes of printing colors and has many advantages over other oils and "foots" used for that purpose. Being miscible with water in all proportions, it lends itself more readily to the mixing of color pastes, is more easily distributed through the color paste, and never separates on standing, as is sometimes the case with other oils. Furthermore, as already stated, Turkey Red oil also enters into the color lake formed, which is not the case with other oils.

Paranitraniline red and alphanaphylamine claret are two other colors with which Turkey Red oil is used where great brilliancy is required. These colors are printed by two different "styles."

One method consists in preparing the cloth with a solution of beta-naphthol, caustic soda and Turkey Red oil. The cloth is then passed through squeeze rolls, dried gently and printed with a paste of diazotized paranitraniline for para red, or diazotized alphanaphthylamine for claret.

Another method consists of printing on the beta-naphthol prepare, drying and developing by passing through a diazo solution of paranitraniline or alphanaphthylamine. For a cheaper class of work soluble oil of a good grade may be used instead of Turkey Red oil.

Turkey Red Oil with Basic Colors

For printing basic colors on cloth, Turkey Red oil may be used with a color paste, as it insures better penetration and fixation of the color on the fiber, gives more level, solid and clear prints, increases the fastness to washing, and minimizes the amount of fixing agent required.

Turkey Red Oil with Direct Colors

For the dyeing of very light fancy shades on cotton, Turkey Red oil can be used with the direct colors, and

overcomes many of the difficulties otherwise encountered. For example, it enables the dyer to produce level shades of excellent penetration, as it prevents the colors dyeing too rapidly.

Colors like mixed browns, chrysamine, etc., will dye more evenly and penetrate better if about 3 per cent of Turkey Red oil is used with them.

Turkey Red Oil with Developed Colors

In the case of developed colors, the use of Turkey Red oil with the developer is strongly recommended, because it assists in dissolving the developer, and decreases the amount of alkali necessary, besides increasing the purity of tone of the color, also its fastness to light and washing. The fact that beta-naphthol and some of the metadiamines will dissolve in Turkey Red oil, and that no caustic alkali is necessary for their complete solution, is of vast importance in the dyeing of developed colors on silk and rayon, especially on hosiery.

Turkey Red Oil as Dyestuff Assistant or Leveling Agent

As an assistant in the dye bath, when the direct colors are being applied to cotton, linen and silk, Turkey Red oil facilitates penetration, level dyeing and the solution of the color. It also increases the fastness of the resultant color to various agencies, while at the same time rendering the colors fuller and more brilliant.

Rayon offers peculiar difficulties in its dyeing, but these difficulties are to a large extent overcome by the use of Turkey Red oil in the dye bath.

Turkey Red Oil with Sulphur and Acid Colors and in the Lake-Making Industries

For dyeing sulphur colors on piece goods and pile fabrics, like corduroy, velveteen, plush, etc., the addition of Turkey Red oil helps to dissolve the dyestuff, gives the necessary penetration, and greatly assists in the dyeing operation.

When used with the acid colors, Turkey Red oil, being unaffected by the addition of dilute acids, remains homogeneous in structure, and is not precipitated as is the case with ordinary soaps.

In the manufacture of such lakes as those produced by pigment scarlet, etc., the function of Turkey Red oil is to decrease or prevent the bleeding of the dry color in water.

In such lakes as those produced by Lithol Red and Alizarine Red its function is simply to improve the brilliancy of the finished color.

When used with dyes like Lithol Rubine, its use is to make those dyes soluble as they are insoluble in water alone.

It is seldom used in the manufacture of the ordinary lakes, but, when so used, it helps to soften the color so as to make its grinding in oil or varnish easier.

Turkey Red Oil in the Coated Paper Industry

Although it is somewhat outside the scope of the present article which deals with textile oils, a few words may be written with regard to the employment of Turkey Red oil in the paper industry.

Coated papers and boards are prepared by applying a suitable mixture of color lake and casein to the surface of the paper, the casein acting as a binder and fixing agent.

As the casein solutions dry and age, they are apt to become brittle and unless a softening agent of some kind is used, the surface of the coated papers become scaly and the coated color surface cracks off at the folds. To overcome this, there is no better agent than a neutral or slightly alkaline Turkey Red oil. The softening properties of the oil itself are retained in the color mixture, and the result is a flexible surface overcoming the objections mentioned above.

Turkey Red oil is also useful as a foam-neutralizing agent in this application as well as in those processes before mentioned.

Soluble Oils

Soluble oil is generally understood to mean a castor oil soap formed by saponifying commercial castor oil with caustic soda, the resulting product being about 50 per cent soap and 50 per cent water.

Under this name there are many preparations on the market which are liquids of an oily appearance, freely soluble in water. Many products of this nature are mixtures of sulphonated oils, while still others contain various proportions of mineral oil in conjunction with a sulphonated oil base.

Mineral oil preparations have a tendency towards harshness, while some of the other oils are liable to spontaneous combustion. On this account, it is a good plan to try the emulsion test before accepting an oil of this nature. Soluble oils are used to some extent in different processes of bleaching, preparing, dyeing and printing with alizarines, mordant dyes, direct dyes, etc., although generally the genuine Turkey Red oil is preferable for this purpose. Soluble oils find their chief application in the finishing of cotton goods where a full, yet mellow "feel" is required. These oils are widely used in the finishing trade to give this full and yet somewhat pliable

"feel" to cotton piece goods, and there are few, if any substances better for this purpose.

In using soluble oils, care must be taken to select those which are homogeneous in structure and permanent in emulsification. Any separation of free oil in the emulsion will cause unevenness in dyeing, and will also be detrimental to the finish.

Softeners

As the process of dyeing tends to harshen fibers, methods and materials are sought which will reduce this tendency to a minimum.

The harshening effect is especially noticeable in the dyeing of cotton warps and yarns, and efforts to overcome this trouble have resulted in a demand for a class of substances, known as cotton softeners. Cotton softeners may be defined as substances designed to reduce or prevent the harshening effect of the dyeing process on cotton; for piece goods they are used in the finishing process, with the various finishing compounds.

There are a great variety of substances on the market known as "softeners," but they may be classified under two headings: (1) soap softeners, and (2) emulsion softeners.

Soap Softeners

As this article deals chiefly with textile oils, we will be compelled to pass lightly over the subject of soap softeners. Analyses of a great many softeners of this kind show their composition to be approximately as follows:

Water	64 to 70	per cent
Soap	27 to 24	per cent
Oil	9 to 6	per cent
Total	100 100	per cent

As the softening properties of the finished compounds are based upon the softening function of the original oil used, it is usually better to use instead Turkey Red oil or soluble. Furthermore, soap softeners give a firm "feel" (not the soft, mellow "feel" desired) and are precipitated by many finishing compounds containing zinc, lime or magnesia as a sticky mass which nullifies their value as finishing softeners.

Emulsion Softeners

An "emulsion" is the "mechanical" mixture of oil and water, together with a slight addition of other substances, wherein the "original properties of the oil are retained" and not disturbed by chemical influence.

It is upon this theory that the various manufacturers of emulsion-softeners base their claims for superiority, and their claims are justifiable.

This type of softener offers many advantages over all other types. For example, these "softeners" are already emulsified and are ready for use immediately on dilution, thereby eliminating a lot of trouble in the finishing room. The best of these emulsions are neutral, permanent, do not separate on standing or dilution, and do not dull or strip colors.

Generally speaking, products of this type contain certain percentages of moisture and volatile contents, which are too frequently considered as an adulteration by buyers. The water contained in the best of these "softeners" is the minimum amount required to preserve the natural emulsification of the oil. Its percentage is quoted for standardization purposes and is *not* "added with intention of adulteration or profit" by reputable manufacturers.

Some manufacturers, aiming at excellency in the production of "softeners," have added glycerine to increase the softening and hygroscopic properties of the compound. Many careless or incompetent chemists have condemned these compounds, overlooking the fact that glycerine was present. In this manner, suspicion has unjustly fallen upon emulsion softeners. Progressive and careful buyers, however, are aware that prices are carefully based on the actual content of oil in these "softeners" and that the slight extra cost of the freight on the water content is compensated for by the ease with which the softener may be employed, and the highly successful results obtained. All these are important factors in reducing the cost of production.

INSTITUTE OF CHEMISTS PLANS EDUCATIONAL LECTURES

The American Institute of Chemists feels that a better understanding should exist with the public in regard to the work which is at present being done in the profession of chemistry and concerning the work which lies ahead of it. For this purpose a committee has been appointed by President Treat B. Johnson of Yale University which recommended that a Speakers' Bureau be organized for the purpose of enlightening the public as to the contribution of the chemist to chemical progress. The efforts of the bureau will probably be confined at first to civic organizations, boards of trade, semi-educational clubs of various types, and with a possible extension of the work to high schools.

The members of the Institute are at present voting on amendments to the constitution which would require that the applicant be a citizen of the United States and that the educational requirement for Fellowship in the Institute consist of six years collegiate and post-graduate work in chemistry and five years' experience in the profession.

At the last meeting of the directors, Dr. C. H. Herty and Dr. M. L. Crossley were elected councilors of the Institute.

Foreign Dyes Imported Through New York and Other Ports During September

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS OF MANUFACTURERS' NAMES

1—THE SIX LEADING GERMAN COMPANIES

IG—Interessen-Gemeinschaft der Farbenindustrie.
A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873.
B—Badische Anilin-und-Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.
By—Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862.
C—Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.
K—Kalle & Co., A. G., Biebrich-on-the-Rhine. Founded 1870.
M—Farbwerke, vormals Meister Lucius & Bruning, Hochst-on-the Main. Founded 1862.

2—THE SMALLER GERMAN COMPANIES

BK—Leipziger Anilinfabrik Boyer & Kegel, Furstenberg. near Leipzig. Founded 1882.
CG—Chemikaliewerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1882.
CJ—Carl Jager G. m. b. H., Anilinfarbenfabrik, Dusseldorf. Founded 1823
GrE—Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.
L—Farbwerk Mulheim, vormals A. Leonhardt & Co., Mulheim-on-the-Main. Founded 1879
tM—Chemische Fabriken, vormals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—SWISS COMPANIES (ALL AT BASEL)

DH—Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.
G—Anilinfarben-und Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.
I—Gesellschaft fur chemische Industrie. Founded 1885.
S—Chemische Fabrik, vormals Sandoz & Co. Founded 1887.

4—DUTCH AND FRENCH COMPANIES

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888
NF—Niederlandische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.
CN—Compagnie Nationale de Matieres Colorantes et Produits Chimiques. Founded 1917. (Etablissements Kuhlmann merged with this company in 1923.)
P—Societe Anonyme des Matieres Colorantes et Produits Chimiques St. Denis (formerly A. Poirrier). Founded 1830.

5—ENGLISH COMPANIES

Bro—Brotherton & Co., Ltd., City Chambers, Leeds.
BAC—British Alizarine Co., Ltd., Manchester
BD—British Dyestuffs Corporation, Ltd., London.
Cl Co.—The Clayton Aniline Co., Ltd., Clayton, Manchester.
CV—The Colne Vale Dye & Chemical Co., Ltd., Milnsbridge, Huddersfield.
Hol—L. B. Holliday & Co., Ltd., Huddersfield.
Scot—Scottish Dyes, Ltd., Grangemouth.

IMPORTS of foreign dyes through the port of New York and other ports amounted to 387,533 pounds in September, with an invoice value of $322,446. Imports by ports were as follows: New York, 355,937 pounds, with a value of $295,917; Albany, 19,625 pounds, with a value of $12,977; Boston, 11,633 pounds, with a value of $12,861; Detroit, 338 pounds, valued at $691.

Imports of Synthetic Dyes

	1926		1925	
	Pounds	Invoice Value	Pounds	Invoice Value
January	190,459	$184,018	403,984	$359,376
February ..	479,027	477,255	373,259	365,268
March	487,804	435,891	527,964	488,501
April	437,526	401,606	451,005	426,141
May	392,739	343,745	370,271	347,904
June	333,319	317,896	376,668	333,654
July	351,425	303,079	420,849	400,366
August	380,414	298,159	330,674	303,612
September .	387,533	322,446	298,858	285,642
Total 3,440,246		3,084,095	3,553,532	3,310,464

Five Leading Dyes, by Quantity, Imported During September, 1926

Indanthrene Blue GCD (single strength)..	23,688 lbs.
Indanthrene Brown G (single strength)...	7,974 lbs.
Alizarine Light Blue B.....	7,000 lbs.
Thionol Green B.....	6,970 lbs.
Ciba Red R Paste.....	6,612 lbs.

Dyes and Intermediates Remaining in Bonded Customs Warehouse

	Coal-Tar Dyes and Colors (pounds)	Coal-Tar Intermediates (pounds)
January 31, 1926.....	703,159	763,409
February 28, 1926.....	596,154	855,170
March 31, 1926.....	447,588	896,530
April 30, 1926.....	359,164	928,593
May 31, 1926.....	535,226	946,120
June 30, 1926.....	671,396	772,475
July 31, 1926.....	512,186	781,796
August 31, 1926.....	557,852	690,031

Per Cent of Dyes by Country of Shipment

	1926			
	Sept.	Aug.	July	June
Germany	50.0	47.0	60.0	51.5
Switzerland	30.0	34.0	30.0	36.0
France	3.0	2.5	2.7	1.0
England	5.0	0.5	1.4	7.5
Belgium	3.0	5.5	4.0	3.0
Canada	7.0	8.5	..	0.5
Italy	2.0	2.0	1.5	0.5
Holland	..	..	..	..
All others	..	..	0.4	..

Imports of Color Lakes

	Pounds	Invoice Value
January	2,773	$2,393
February	143	....
March	58	....
April	834	....
May	3,360	3,077
June	2,720	1,598
July	2,844	1,877
August	167	....
September	3,900	2,502

The dyes in this report are grouped by both Colour Index and Schultz numbers, and, in the case of those which could not be identified by either number, the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single-strength basis.

DYES OF COAL-TAR ORIGIN

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
54	64	Sorrel Red X—(IG)	1,000
80	83	Ponceau 3R—(IG)	100
105	88	Acid Anthracene Brown R—(IG)	400
131	122	Cotton Pink GN—(IG)	200
145	140	Jasmine, High Conc.—(G)	1,102
196	175	Acid Ponceau E—(G)	220
278	—	Chlorantine Fast Red 7BL—(I)	551
288	256	Sulphon Cyanine G—(IG)	2,000
316	273	Diaminogene NA—(C) Diazamine Blue BR Conc.—(S)	3,091
324	—	Diazo Brilliant Scarlet ROA—(IG)	500
325	—	Brilliant Benzo Violet B—(By) Diamine Brilliant Violet B—(C) Diamine Fast Violet 2FBN—(IG)	1,718
326	279	Benzo Fast Scarlet 5BS—(IG)	300
346	296	Cotton Yellow G Extra—(IG)	300
376	313	Congo Rubine B—(IG)	100
382	319	Chloramine Red 3B—(S)	5,714
409	339	Diamine Orange B—(IG)	2,300
430	—	Polar Red R Conc.—(G)	1,014
436	358	Chloramine Brilliant Red 8B Conc.—(S) Chloramine Red 8BS—(By) Chlorantine Red 8BN—(I)	2,602
443	—	Acid Anthracene Red G—(IG)	100
448	363	Cotton Red 4BX—(IG)	500
459	373	Congo Orange R Powder—(Q) Diamine Orange F—(IG)	1,110
516	423	Blue NBB—(IG)	1,000
561	449	Trisulphon Brown B Conc.—(S)	4,003
577	457	Trisulphon Brown 2G Conc.—(S)	4,003
590	471	Polyphenyl Blue GC—(G)	551
628	206	Diphenyl Catechine G Supra—(G)	4,409
632	18	Diphenyl Fast Yellow GL Supra—(G) Diphenyl Fast Yellow RL Supra—(G)	110
636	19	Fast Acid Yellow 3G—(C) Fast Light Yellow 2G—(By) Fast Light Yellow 3G—(By)	2,746
639	22	Supra Light Yellow 2GL—(IG)	403
653	—	Pyrazol Orange R Conc.—(S)	500
658	496	Setoglaucine—(G)	551
664	501	Acronol Brilliant Blue—(BD)	60
657	503	Benzyl Green B—(I) Erioviridine B Supra—(G)	1,763
670	505	Light Green SF Yellowish XX—(IG)	400
671	506	Kiton Blue L—(I)	4,408
677	512	Magenta Powder AB—(IG)	2,000
680	515	Methyl Violet NFB—(IG)	2,000
681	516	Crystal Violet Extra—(IG)	500
691	523	Fast Green Extra Bluish Conc.—(IG)	4,875
697	529	Acid Violet 6B—(IG)	1,000
699	531	Eriocyanine AC—(G)	1,102
704	536	Alkali Blue 4R—(K)	200
712	543	Patent Blue V—(IG)	2,000
714	545	Acidol Blue—(Q) Brilliant Acid Blue A—(IG) Poseidon Blue BR Extra—(IG) Poseidon Blue BXX—(IG)	3,539
715	546	Blue Extra—(IG) Blue FF—(IG) Cyanol Extra—(C)	2,357
718	549	Brilliant Chrome Violet 4B—(DH)	110
727	557	Chrome Violet—(G) Chrome Violet CG—(DH)	165
729	559	Victoria Blue B Base—(IG)	150
731	560	Night Blue—(I)	220
735	564	Kiton Fast Green V—(I) Naphthalene Green V—(M) Poseidon Green VGGX—(B)	1,203
736	565	Wool Blue G Extra—(IG)	200
749	573	Rhodamine B Conc. (s. s.)—(G) Rhodamine B Extra (s. s.)—(IG)	5,100
773	592	Erythrosine—(Q)	49
774	593	Phloxine—(Q)	50
789	—	Patent Phosphine G—(I)	441
793	606	Phosphine 3R—(IG)	3,000
797	608	Patent Phosphine RRDX—(IG)	250
801	613	Quinoline Yellow Extra—(IG)	200
802	—	Quinoline Yellow KT Extra Conc.—(IG)	300
813	198	Mimosa Z Conc.—(G)	551
815	618	Rhoduline Yellow 6G—(By)	200
828	672	Rosinduline GXF—(K)	308
829	673	Rosinduline 2B Bluish—(K)	931
833	—	Wool Fast Blue BL—(By) Wool Fast Blue GL—(IG)	2,355
842	680	Methylene Violet 3RA Extra—(IG)	250
865	700	Nigrosine T—(IG)	600

(*Continued on page 737*)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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OCTOBER MEETING OF THE SOUTHERN SECTION

The annual meeting of the Southern Section of the American Association of Textile Chemists and Colorists was held at the Hotel Cleveland, Spartanburg, S. C., on Saturday evening, October 16, 1926. The meeting was preceded by the usual informal dinner.

After the routine business of the section was transacted Chairman Leonard S. Little introduced the first speaker of the evening, J. M. Hatch, secretary of the Belmont Processing Company, Belmont, N. C., who addressed the meeting on "Developments in Mercerization." His paper is published below.

J. E. Dean, superintendent of the finishing plant of the Pacific Mills, Lyman, S. C., presented a paper on "Discharge Printing," which covered the subject with unusual thoroughness and contained a great amount of valuable technical information concisely presented.

Following Mr. Dean, John A. Law, of Spartanburg, S. C., a leader in the textile industry of the South, explained clearly and interestingly the purposes of the Cotton Textile Institute recently organized. The addresses of both Mr. Dean and Mr. Law also appear below.

Respectfully submitted,
H. W. ORMAND, *Secretary.*

Developments in Mercerization

By J. M. HATCH
Secretary, Belmont Processing Company, Belmont, N. C.

As you all very likely know, the mercerizing business in the United States is only a little more than twenty-five years old; we find the first patent covering the formula of mercerizing was issued in 1850 to John Mercer of Harvard, England, for whom this process was named. Mr. Mercer was chemically treating cotton yarn to increase the tensile strength and not to gain luster or gloss which we now mercerize to obtain. Mr. Mercer was using yarn made from very low grade cotton, putting it through a chemical process, increasing the tensile strength by about 17 per cent, removing a certain portion of foreign substance, and reselling same in competition with those manufacturing yarn of a much higher grade.

Mr. Mercer died in 1866, knowing very little of the wonderful possibilities held in his formula. There was practically nothing done in the way of mercerizing from the time of his death until 1890 when another patent was issued to a man named Lowe, a chemist of Manchester, England. Mr. Lowe was mercerizing yarn without tension; a lengthwise shrinkage of about 12 per cent is the result of such mercerizing. Mr. Lowe was then weaving this mercerized yarn in stripe with unmercerized yarn, washing and ironing out, which would bring the mercerized yarn partly back to its original length, thus giving him a gathered or puckered piece of fabric. Mr. Lowe was also using yarn made from low grade cotton, and the luster he was able to obtain was of no commercial value.

About one year later or in 1891 another patent was issued to a man named Thomas, who was connected with

one of the big German dye concerns. Mr. Thomas was mercerizing in order to give the yarn a greater affinity for dyes, and it was he who developed the luster on a commercial basis. Mr. Thomas was using, however, yarn made from high-grade Egyptian cotton, and it is very probable that Mr. Mercer and also Mr. Lowe would have developed the same luster provided they had been experimenting with yarn spun from the same character of cotton.

A basic patent was issued to Mr. Thomas in Germany, France, England and the United States covering this process. Mr. Thomas started mercerizing in 1891, but very little was known of this in the United States until about 1896 when his production outgrew the local consumption and be began shipping yarn into this country; then the American manufacturer immediately set out to match this luster.

So far as the mercerizing business in this country is concerned it might be divided into three periods:

The experimental period, from 1896 to 1899.

The litigational period, from 1899 to 1906.

The normal period, from 1906 up to the present time.

There are several concerns who claim the honor of being the first to mercerize yarn in the United States. Among these are the Acadia Mills of Lawrence, Mass., the Hampton Company of Easthampton, Mass., Aberfoyle Manufacturing Company of Chester, Pa., and Forest Brothers of Philadelphia.

In 1899 the American Mercerizing Company was organized by John H. Lorimer, whose company bought the American right to mercerize under Thomas' patent, for which they were to pay Mr. Thomas the sum of $750,000 provided this basic patent would stand the test of the United States courts. In 1901 the Aberfoyle Manufacturing Company was licensed to mercerize under this patent through the American Mercerizing Company. About the same time the Hampton Company started mercerizing without a license, and immediately a suit was entered against this company by Mr. Thomas for infringing on his patent. This case was not decided until August 7, 1906, when a decision was rendered by Judge Lowell of the United States Court of Boston, Mass., in favor of Hampton Company. This nullified the Thomas patent, which left the same open for the use of anyone.

From 1899 to 1906 there were several United States patents issued, covering mercerizing machines, and during this period there were quite a number of firms who attempted to start in mercerizing. But these were immediately faced with a suit for infringing either on the patent covering a mercerizing machine or one covering the process.

In 1906 the production of mercerized yarn was only a few million pounds. Last year, in 1925, there were something over sixty million pounds of yarn mercerized in the United States. For a long time it was claimed by practically all the New England mercerizers that this could not successfully be done in the South. One reason was that a few New England manufacturers held the secret and it was thought no one else would ever know how to mercerize, and another reason was that the water in the South was not suited for mercerizing. There is now no secret to mercerizing, and the later obstacle has long since been overcome by the modern purification plants and water softening devices.

The first mercerizing plant to be established in the South was the Southern Mercerizing Company at Tryon, N. C., organized by Mr. Bacon in 1909. He started with a production of only a few thousand pounds per week, but now has the largest mercerizing plant in the United States on single yarns. More than 50 per cent of the two-ply yarn mercerized in the United States to-day is done in the South, and a great deal larger percentage of the single yarn. There are located in North Carolina three mercerizing plants on two-ply yarn and in Tennessee the same number with a total capacity of over three-quarters of a million pounds weekly. North Carolina has four skein mercerizing plants on single yarn and South Carolina one.

Luster

Why yarn submerged in a certain strength caustic solution will add luster is yet to be determined. However, by carefully analyzing cotton fiber we find the outer casing is a very thin undefined composition. Inside are the layers of cellulose. The caustic solution removes this outer casing and leaves exposed the cellulose which has by far a greater light reflecting power than the outer shell, thus increased luster. The twist is the most important factor. Certain standards have been set known as mercerizing twist.

The tensile strength of cotton yarn after being mercerized is increased by about 17 per cent. The strength of no individual fiber has been increased. By analyzing this fiber before mercerizing we find it contains many curves and kinks, but after it has been subjected to a certain strength caustic solution the fiber itself has been increased in diameter about 60 per cent, all the curves have been straightened out, all fibers paralleled, and the clinging quality has been increased manifold. Cotton fabrics are being mercerized quite as successfully as yarn, and it remains to be seen what the future holds in the development of mercerizing cotton yarns and fabrics in this country.

Proceedings of the American Association of Textile Chemists and Colorists

Discharge Printing *

By James D. Dean
Superintendent Finishing Plant, Pacific Mills, Lyman, S. C.

That branch of the textile printer's art covered by the subject assigned to this paper includes within itself so many and such diversified printing possibilities that a complete enumeration of them all might carry us beyond the limits available for a treatment of this kind. It will be well, therefore, to confine our discussion to a relatively few examples, as fairly representative of the field as we can readily hit upon, and (of choice) rather simple in their nature. At best, printing is a technical subject, and it is not easy in discussing it to avoid terms which may be unintelligible to those not familiar with the work. Print works are not common in this section of the country—the industry is largely confined to New England and the Middle Atlantic States—and it is a fair assumption that many of those present to-night, though connected in some way with the textile industry, have little acquaintance with the technicalities of cloth printing. We must, therefore, beg the indulgence of any print works men present while we attempt to outline to the uninitiated just what discharge printing is, and a few of the effects secured by using it. With this warning before you, it is scarcely necessary to add that we have no hope of contributing to-night anything new to the world's knowledge of our subject. It is merely a simple review of a few well-established processes which is to be set before you.

As modern printing methods are more or less alike wherever employed, we shall here treat only of cotton piece goods printing. Everyone, it may be assumed, is familiar with at least the operating principle of the textile printing machine. The cloth, in continuous open form, passes around a large central cylinder, between it and the small engraved copper rollers arranged around its circumference. Each small roll is engraved with the design, or part of the design, to be printed; each revolves in its own box of color paste, and lengthwise across the face of each roller rests the delicately adjusted "doctor" blade, which scrapes off cleanly the thick color paste from the surface of the copper, permitting only the paste carried in the engraved pattern, cut below surface level of the copper, to be carried on as the roll revolves and stamped upon the cloth. As each roller necessarily carries but one color and prints upon the cloth only that color fraction of a design which may consist of ten or twelve or more colors, there can be appreciated the absolute accuracy required of the engraving on each roll, and the perfect adjustment or "fit" necessary for all of them. The familiar sight of the "Sunday comics," where the blotches of crude color in the prints frequently miss their proper bounds by a sixteenth or an eighth of an inch, is an example of bad printing which could not be tolerated in the textile trade.

Our subject being a special branch of printing, perhaps it is high time that we narrow down this general discussion to the topic in hand. A definition may well be in order—suppose we try to state exactly what is meant by discharge printing, and when and why it is employed. A discharge print may be described as a white or colored pattern obtained upon a dyed ground by printing on some substance which removes locally (that is, within the limits of the printed design) the dye or mordant originally covering the cloth. A plain white discharge merely cuts out the ground color upon which the print falls, leaving a white pattern surrounded by the unchanged ground color. A colored discharge is obtained by employing with the discharging agent some color, itself impervious to discharge, which is fixed upon the white space cut out from the original dyed ground. The resist, or, as the English call it, reserve style of printing, so nearly like discharge printing in effects produced that it can well be described with the latter, is obtained by printing on the white cloth some substance capable of resisting within the limits of the printed pattern the dye of a bath through which the cloth is to be subsequently passed. As with discharge printing, both white and colored resist effects may be obtained. Note that both discharge and resist printing presuppose dyed cloth—in the first case the cloth is dyed and then printed, in the second the cloth is printed and then dyed. The discharging substance is chemical in its action, reducing and destroying the dye upon which it falls. The action of the resisting substance is mainly physical (though chemical resists may be employed), its function being merely to prevent the action of dyestuff.

Nature of the Discharging Agent

The reason for employing these styles may be briefly stated. With the development of discharge work (we shall treat a little later of the resist style) an entirely new field of possibilities was opened to the calico printer. He was now able to secure upon dyed grounds white and colored printed effects which could be produced in no other manner. In explanation, we may say that trying to cover white cloth completely by color applied from the printing roller has never been very practical, and even when the physical difficulties of such printing are surmounted, it is impossible to penetrate the cloth with the printing paste sufficiently to secure a result comparable to the solidity and evenness of shade produced in the dye bath. Resist printing, probably older in develop-

*A paper presented before the Southern Section of the American Association of Textile Chemists and Colorists, Oct. 16, 1926.

ment than the discharge style, had availed something along these lines, but its use was restricted. Without a practical discharge agent, it was impossible to print a bright and delicate color pattern upon a dyed ground. Suppose we desired to print, let us say, a pink flower pattern upon a blue dyed cloth. Without a discharging agent, our pink pattern falls upon the blue ground and becomes a violet. Using the proper discharge agent with the printing color, the blue ground is cut out within the limits upon which the print pattern falls, and the full delicacy and brilliancy of the print is retained. It appears, then, that the key to this new field of printing possibilities (if fields may be said to have keys) was the discovery and employment of a satisfactory discharging agent. Let us examine a little into the nature of this agent upon which the possibility of discharge printing depends. Such a compound evidently merits investigation.

A number of substances, generally reducing or oxidizing in action, have been used for this purpose in the past, and no doubt are still employed to some extent—such as the titanium compounds and tin chloride discharges prominent in English manuals on the subject; but the one agent now so universally employed that we can afford here to disregard consideration of all others is sodium hydrosulphite. The accepted chemical formula of this compound in its simplest form is $Na_2S_2O_4$. For certain purposes, such as reducing an indigo vat, or stripping dyed cloth, we can readily make a workable preparation of hydrosulphite by stirring zinc dust into a commercial solution of 60 deg. Tw. bisulphite of soda, using roughly a pound of zinc dust to a gallon of bisulphite, and keeping the temperature of the reacting mixture within certain limits—a block of ice in the mixing tub will take care of this. When the reaction is complete, a little caustic soda is added to aid stability, and the hydro solution is quite ready to use in keeping an indigo vat in working order—"sharpening" it, as the Germans say. It isn't, however, very stable in nature, and such a solution will hardly be usable twenty-four hours after making. A better kind of hydrosulphite is sold in powder form—Hydrosulphite Concentrated Powder was the old trade name. In closed containers this keeps reasonably well, and is the material largely used in vat color dyeing. These preparations of hydrosulphite, indispensable in their field, were not of much use to the calico printer. They decomposed too quickly, and broke up entirely at high temperatures. It wasn't until the formaldehyde compounds of hydrosulphite were perfected that discharge printing really came into its own. These are prepared by adding formaldehyde to the hydro solution in process of manufacture and evaporating *in vacuo*, from which point perhaps the most widely used form is separated by fractional crystallization. This product occurs as a white, semi-translucent solid, chemically a rather complex formaldehyde-sulphoxylate of sodium, $NaHSO_2.CH_2O.2H_2O$, readily soluble and quite fairly stable, familiar to printers under the old trade names of Hydrosulphite NF Conc., Rongalite C, Hyraldite Conc., etc. Here was a reducing agent which really met the printer's requirements. It kept reasonably well in the color shop, dissolved readily in hot water without decomposing, mixed perfectly in his printing pastes, and when cloth printed with it passed into the ager, in an atmosphere of slightly superheated steam, the compound broke up and came to life as a powerful reducing hydrosulphite which would discharge a dyed ground without tendering the cloth. With such an auxiliary at command, an almost endless variety of discharge effects could be produced. Let us consider in detail a few of these possibilities.

Selection of Ground Colors

For a successful discharge print, the colors selected must obviously meet two requirements. That used in producing the ground shade must be of a nature permitting ready discharge or "cutting," while the color employed in the printing paste must itself be unaffected by the hydrosulphite used. Fortunately, a large number of the ordinary direct dyeing or substantive colors, naturally used in producing the ground shades, are readily dischargeable. Some direct dyes, however, don't discharge, and this is a point which the print works dyer must constantly keep in mind. Just why certain dyes will discharge and others will not involves some complicated chemistry which we may leave to the dye manufacturer to explain. It is sufficient for our purpose to note that in print works dyeing the ground shades must be selected with an eye to the work in hand. For very heavy shades, such as navies, a satisfactory line of diazotized and developed colors is available; readily discharged in the deepest dyeings, and of good fastness to washing. This last point is important, especially in white discharge work, for the ground color employed must be capable of undergoing an ordinary wash or soaping without bleeding into the print pattern. A goodly number of print colors suitable for discharge work are ready for selection. Many of the pigments, especially those of the color-lake type, will stand the action of hydrosulphite. During the war, when other colors were hard to get, the pigments were of considerable importance in discharge printing. Many popular basic colors, the most brilliant and attractive in the cotton printer's list, are well suited to this work. Auramine, the Rhodamines, Thionine Blue, Brilliant Green, are representative of this widely used group. Nearly all the vat colors, a large and growing family, are available. With a possible choice among so many excellent colors, perfectly adapted to the work, it

is not surprising that varied and beautiful effects can be obtained.

The first example selected for illustration is the simplest discharge print to be found—a plain white discharge on a navy blue ground. The cloth was dyed on the jiggs in the dyehouse, diazotized and developed, washed and perhaps soaped as well, dried and wound on rolls for the print room. Here the dyed cloth is printed with the white discharge paste (one roller will do for a simple pattern such as the polka dot), dried on the drying cans behind the print machine, passed through the hydrosulphite ager, given a light wash or soaping, dried and finished. Though we do not propose here to go deeply into printing formulas, a general indication of the composition of the white discharge employed may be of interest. One hundred parts by weight of a typical white discharge for heavy shades may contain in round numbers 15 parts of hydrosulphite, 65 of starch paste, 10 of zinc oxide, 2½ of glycerine and 7½ of water. Zinc oxide is usually employed in these prints, as the formula indicates, and of course the quantity of hydro used may be varied to meet the resistance encountered in discharging. Sometimes a little anthraquinone is added to assist the hydro by its catalytic action. As the cloth leaves the drying cans after printing, the pattern upon it is hardly perceptible except for the small amount of zinc white present. In the ager, however, the hydro does its part, the ground shade is cut out where the print has fallen, and a washing to clear the white is all that is necessary before the cloth is ready for finishing. The ager to which we have referred is an iron box or chamber, ranging from 16 to 30 feet in length, in which an atmosphere of steam is maintained, the air being excluded as completely as possible, and through which the printed cloth travels at a controlled speed, usually such that a given yard requires from three to four minutes to complete its passage. The temperature and moisture content of the ager steam are adjusted to those conditions which experience has proved to be best suited to the particular style of print being handled. Though some kinds of prints will stand or require a certain amount of moisture in the steam, it is essential that all hydro work should be thoroughly dried before entering the ager.

Where Discharge Is Necessary

Pigment and basic colors are used to produce discharge prints of endless variety and sometimes of great beauty. Their employment is a little more complicated than in the case of white discharge alone, for neither of these types possesses affinity for cotton cloth, and their printing pastes must contain the color, the hydro for discharge, and some agent whose function is the fixation of the color on the fiber. For the basic dyes a solution of tannic acid in alcohol is usually employed, while a little albumen, which coagulates during the steam treatment, serves for the pigments. A somewhat longer exposure to the steam atmosphere, to assist the fixation of the colors, may be given to this class of discharge. In the large variety of shades used in printing these designs, it is by no means necessary to discharge each one into the dyed ground. The hydro is used only where it is required to retain the brightness and delicacy of the print color. If, for example, a deep blue pattern is to be printed on a light blue ground, there is no occasion to discharge it in, for the deep blue will be quite satisfactory if simply overprinted on the lighter ground. The pigment black which appears so frequently in these designs requires no discharge, for a black is usually a black, no matter what color underlies it. It is a question for the nice judgment of the colorist in charge to decide just where the line is to be drawn, and where discharge is or is not necessary. Frequently he has to resort to actual experiment to settle the problem. Except for the steaming treatment, these goods are handled just as the white discharge prints already described, though the basic prints may be run through a solution of antimony salt to aid fixation prior to the final wash before finishing.

Vat Color Discharges

The vat colors, because of their greater cost generally employed on the finest grades of work, lend themselves naturally to this kind of printing. A vat color requires hydrosulphite to reduce and render it soluble for printing—with many of them reduction and penetration of the fiber take place in the ager—so it is simple in discharge printing to add a little extra hydro to take care of the ground shade. These prints are dried, aged and chromed, and as they usually require a hot soaping for their development, may receive that treatment up to the limit that the ground shade will stand. Developed or coupled colors are usually employed in dyeing the grounds for this class of work, as they are faster to washing than the regular direct colors.

Aniline Black Resist Style

We have previously referred to the resist prints as resembling the discharge style in effects produced, though different in application. There is but one type

of resist print that we propose to mention here—the style is not strictly a part of our subject—and that is the one used in connection with dyeing Aniline Black. No finer black on cotton than that formed by the oxidation of aniline has ever been known, and it has been enormously used for many years. It is so resistant to all color-destroying influences that once developed it cannot be discharge printed. Strong hydro application may temporarily reduce the color and turn it brown, but it soon oxidizes back again to a black. Aniline black is dyed, in general terms, by passing cloth through a bath composed of aniline in soluble form—usually the hydrochloride—and oxygen supplier (chlorate of soda) and an oxygen carrier, such as prussiate of soda. The cloth is then dried, passed through the ager, and generally given a chroming or equivalent treatment to complete the development of the black. It was discovered that certain substances applied to the cloth before dyeing would successfully resist the action of the aniline bath. From this fact the aniline resist print is developed. Oxide of zinc is a popular substance for this resist, though other agents such as the tin compounds are used. Basic colors will function in combination with the zinc white, so both white and colored resists are possible. With the printing paste finely ground zinc oxide is incorporated, and dissolved basic dye is added if a color resist is desired. The undyed cloth is then printed, dried, padded with the aniline dye liquor, dried, aged, chromed and soaped. The process is simple, and the results striking and effective.

One special type remains for consideration. A paper of this nature could hardly be considered complete if it failed to touch upon the discharge printing of indigo. This color is in itself perhaps the most interesting of all the dyes, and its successful discharge involves as clever a bit of chemistry as the printing industry has known. Indigo has been employed as a coloring matter for fabrics pretty well throughout the range of recorded history. Text-books tell us it has been identified on the fiber of Egyptian mummy wrappings dating back some five thousand years, which, compared to our modern coal-tar colors, is an imposing antiquity indeed. It may be noted in passing, though, that in one way indigo is compelled to yield rank of seniority to those earliest of all coloring matters, the natural pigment earths—used by ancient men to enrich their drawings on the walls of Altamiran caverns some 25,000 years ago, if we may accept the estimates of scientists. As a dye for fabrics, however, indigo is undoubtedly very old. It is also the first of the type of vat colors, the forerunner of a long line of the best dyes modern chemical science has produced. Indeed, many of the most widely used today of these vat dyes are halogenated derivatives of indigo—synthetic indigo, of course. These brominated children possess better dyeing qualities than the parent. This recalls an interesting story which two or three years ago went the rounds of the technical journals. It related to the rediscovery of the famous Tyrian purple, the color of kings and emperors—a dye of marvelous beauty—and of price as well. Its secret had perished with the ancients, its preparation was the lost art of an older day, but tradition had preserved the tale of its glory, and, more to the point, the fact that it had been prepared from a shellfish, humble inhabitant of eastern Mediterranean shores, known as the Murex. A practical minded German scientist gathered Murex in numbers, collected from each the tiny drop of mysterious dye liquor which the neck vein yielded, and when enough was secured, analyzed it. Strangely enough, this mysterious coloring substance, the wonder of ancient days, proved to be chemically identical with one of the lower-brominated indigo derivatives, one which modern dyers had long discarded, as too dull and fugitive, in favor of the more highly brominated series. Thus iconoclastic science destroys our cherished myths. But it is an interesting story, and its connection (somewhat remote) with indigo is our excuse for repeating it here.

Discharge Printing of Indigo

The discharge printing of indigo is of great importance, and, as we have intimated, involved some clever chemistry before the process was perfected. White printed indigo-dyed cloth is enormously used. In this section of the country where the blue jeans are popular, the printed effect is not so much in evidence, the jeans, as far as the writer has observed, being usually either plain dyed or presenting a chambray effect, gained by using indigo-dyed warps with white filling, and having no printing at all. In other sections the overall or jumper of printed indigo is in favor, and an astonishing yardage of cloth dyed with indigo and discharge printed with pencil stripe or dot pattern is turned out each year. Regular hydrosulphite compounds cannot be used to discharge indigo. To be sure, it discharges, or at least reduces, readily enough, but true to its vat nature the reduced indigo reoxidizes as soon as it comes out of the ager. Many attempts were made, by placing a wash box close to the ager, to run the cloth into a hot alkaline solution as soon as it left the steam, hoping to wash out the reduced indigo in the print pattern before it could oxidize back to a blue. However, it was too uncertain a method, and results were unsatisfactory. The chrome and acid cutting mixtures with which indigo was discharged

before better methods were perfected certainly produced a good white—there was no doubt about their efficiency. However, it was vicious stuff to handle in the print room, and to put on cotton cloth, and there was always the danger, if the acid mixture was not entirely washed out after printing, of the cloth falling to pieces—sometimes on the customer's shelves. Something better was needed for a proper indigo discharge, and the German chemists produced it. After careful research an organic compound was hit upon—a complex benzyl derivative, named Leucotrope W—which in the presence of zinc oxide would unite in the ager with reduced indigo to form a permanent compound, really a new dyestuff, yellow to orange in color, which was unaffected by the atmosphere but readily soluble in alkalies. This discovery solved perfectly the great difficulty of indigo discharge. Hydrosulphite CL, a product formed by adding the new Leucotrope to the old Hydrosulphite NF Conc., appeared upon the market. When indigo-dyed cloth was printed with it and passed through the ager the hydrosulphite reduced the indigo in the regular way, and the Leucotrope combined with the indigo thus reduced to form a permanent orange colored compound, impervious to air and moisture. When passed through a bath of hot dilute soda ash or caustic the yellow-orange print was dissolved entirely away and the clean white discharge pattern left on the cloth. A troublesome problem had been neatly solved.

This completes the list of examples selected in illustration of our subject. The treatment here of the technique of discharge printing has been sketchy in the extreme, and there are many important colors and styles belonging to this department which we have entirely omitted. Other omissions have doubtless been many, even among the subjects discussed. However, details of this kind should be treated with a certain discrimination. Not every one has Dr. Slosson's gift for investing a technical subject with lively dramatic interest, and to introduce into such a paper the highly complicated detail of printing formulas or aging data would neither tend to keep it from the dry-as-dust class, nor, it may be assumed, greatly benefit the average listener. Such information (it may be found in the printing manuals) is of value only to the specialist, and may be reserved for discussion among experts. We have tried to outline in simple fashion the main elements of discharge printing, and to illustrate a few of the results it yields. If we have succeeded in conveying such information with a fair degree of clearness, the purpose of this article may be considered fully accomplished.

The Purposes of the Cotton Textile Institute*

By John A. Law

As I see it, the prime object of the Cotton Textile Institute, now in process of organization, or as dear old Dr. Carlisle used to express it, the *"magnum opus"* of the institute—its great work—is to increase the use of cotton goods, to create new uses, to find new markets, if possible, some that we have lost, and in every way to provide outlets for cotton textile products.

There are, of course, innumerable necessary steps toward the accomplishment of this end. There must be a united purpose, made effective through an organization national in its scope. There must doubtless be a grouping of the different mills producing similar products, or catering to similar trades. There must unquestionably be exhaustive study of the conditions affecting the industry, statistics showing these conditions must be compiled and the pathway illuminated not only by the light of past experience, but by the—at times—blinding glare of new conditions.

There must be scrutinies and comparisons of cost, with better cost analyzing and accounting methods. There must be price comparisons and influences exerted that tend to stabilization of prices, without, however, agreements that may be construed as combinations in restraint of trade, the real object, as above stated, being to expand trade rather than to restrict it. There must be more concerted efforts toward elimination of waste and a better utilization of our waste products, and, of far greater importance than some of the matters above mentioned, there must be created closer ties and closer relations with the allied industries—such as your own—or what really may be termed branch industries of cotton manufacturing, daily becoming more and more numerous, and of greater and greater importance.

That a task of such magnitude can be accomplished within a short space of time, or that the institute can be expected to prove an immediate panacea for our ill is, of course, not expected by those who have been attempting to develop the movement, but that a start along such lines is absolutely essential to the welfare of the industry, I am sure I need not argue before this group of men.

Basic Handicaps in Textile Industry

We had just as well face the situation squarely. The cotton manufacturing industry has for some time past been floundering. In New England all that has saved the situation from disaster has been the strong financial position of well established mills, due to earnings of previous years. In the South, adequate profits on the

*An address before the Southern Section of the American Association of Textile Chemists and Colorists, Oct. 16, 1926.

investment have not recently been possible, even with our much heralded advantages.

Every industry has certain elemental features, or characteristics, differentiating it from other industries. Perhaps I might say that every industry has certain basic handicaps not common to other industries. To my mind, two of the most important elemental features in the textile industry are, first, the large investment in proportion to the value of the manufactured product, or output, and, second, the large number of people necessary in the operation of the plant.

The value of the output of the average cotton mill seldom exceeds the amount invested in the plant. In other words, the average cotton manufacturer can make but one turnover of his stock, a condition which to the average merchant would soon spell bankruptcy. It stands to reason that under such conditions continuous plant operation is vital to success, or, in other words, that curtailmment of output automatically increases this basic handicap.

While ranking, perhaps, third, in importance, the textile industry, we are told, ranks first in number of people dependent upon it. It is hardly necessary to argue that this fact carries with it the great responsibility of providing for the large number of people, and keeping them profitably and happily employed—and this cannot be done if the mills are to be periodically closed down and the people turned out to graze.

Mention is made of these two elemental characteristics not with a view of arguing against curtailment, which may at times be necessary, just as doctors find it necessary at times to starve a patient, but it should be only with a view of arresting, and thereby correcting disease, and not a continuous or permanent treatment.

On the other hand, a constructive effort to provide new outlets and extend the uses of cotton goods, already so wonderfully varied, seems to me a task that may well challenge the talent of those inside and out of the industry.

What more practical or more permanent help can be extended to the cotton farmer than opening up outlets for various manufactured products to which his raw cotton is essential? What could be more helpful to the nations of the world than supplying this cheapest, most comfortable, most sanitary of all clothing, in ample quantity and in ever increasing variety of styles?

Value of Organization

Almost all of the larger industries in this country have been made more effective through closer organization. In fact there is none, that I know of, of similar importance to the textile industry that is as yet unorganized.

The fact that there have been, and still are, marked sectional differences in the industry only makes co-operation, at least along selected lines, that much more necessary, this in reality being the natural—not to say inevitable—way of gradually removing such differences.

Existing organizations representing such allied industries as converters, finishers and jobbers of cotton cloths, as well as those engaged in the merchandising of raw cotton, have, perhaps, wondered why a place has not ere this been created for them in the organization, but in view of the obstacles within the manufacturing industry alone which had to be overcome, I am sure that it was the part of wisdom for the organization to have been developed as it has been, and that proper ties will soon be made with these natural allies.

The movement, since its inception during the present year, has assumed surprising and most gratifying momentum. Twenty million spindles, or more than one-half of the industry, are signed up in advance of the formal organization meeting. Geo. S. Sloan, heretofore secretary of the Copper and Brass Institute, has been employed as secretary.

While the chief executive officer has not yet been decided upon, it is understood that he will be selected from *outside* the industry, and will be a man of outstanding rank and ability.

In my judgment the movement unquestionably marks a new era in cotton manufacturing, and its benefit not only to the cotton manufacturer but to the producer of raw cotton on the one hand and the finisher and user of cotton goods on the other is, it seems to me, a matter solely of proper organization and team work.

OCTOBER MEETING OF THE RHODE ISLAND SECTION

The October meeting of the Rhode Island Section of the American Assoliation of Textile Chemists and Colorists was held in the rooms of the Providence Engineering Society, 44 Washington Street, Providence, R. I., Friday evening, October 15, 1926, at 8 p. m.

The speaker of the evening was Dr. C. S. Hollander, Chief Chemist of the Rohm & Haas Company, and the subject of the paper was "The Manufacture and Use of Hydrosulphites."

At the conclusion of Dr. Hollander's speech there was an interesting discussion, after which a rising vote of thanks was extended the speaker.

The meeting adjourned at 9.30. Fifty-one members were present.

Respectfully submitted,

A. N. Dana, *Secretary.*

Proceedings of the American Association of Textile Chemists and Colorists

The Manufacture and Use of Hydrosulphites

By Charles S. Hollander
Chief Chemist, Rohm & Haas Company

Although the hydrosulphites have been known since Schoenbein's and Schuetzenberger's investigations, no attempt was made to make them on a large scale, until the synthesis of Indigo had been successfully accomplished. The logic is quite obvious. If you can make a synthetic indigo of approximately 95 to 98 per cent purity, why counteract all the benefits, such as pure shade and controllable conditions, by vatting it with reducing substances, the strength and composition of which are not known or strictly controllable?

The next step, therefore, was to bring a dry sodium hydrosulphite on the market, and it had been only a few years before the great war that Germany had been successful in making a sodium hydrosulphite concentrated, that was stable enough to be shipped to great distances. The imports were cut off by the war and an acute shortage developed after the accumulated stocks had been used up. Those anxious to take up its manufacture in this country had to spend large sums of money in research work before large scale manufacture could be thought of; and even then the yields were so poor that we thought we would never be able to reduce the price below 50 cents a pound.

As you know, the fundamental reaction of all of these compounds is the action of iron or zinc or sulphurous acid; already observed around 1718 by Stahl; later substantiated and extended by Berthollet (1789), Fourcroy and Vauguelin (1798). Schoenbein in 1852 was the first one to notice its strong reducing action, for instance on indigo. Schutzenberger isolated sodium hydrosulphite in impure form in 1869. Beruthsen cleared up its constitutional formula between 1880 to 1900.

Whenever zinc is brought in contact with an acid, hydrogen is liberated, but in the case in hand the nascent hydrogen reduces the sulphite ion to hydrosulphite ion, and no gaseous hydrogen is liberated. Usually SO_2 is used in the form of bisulphite of soda solution, and the reaction may be written as follows:

$$4HaH\,SO_3 + Zn = (Na\,S_2O_4 + ZnSO_3) + Na_2SO_3 + 2H_2O \qquad (1)$$

It so happens that a double salt of one molecule of sodium hydrosulphite and one molecule of zinc sulphite is formed that is difficultly soluble in water, and in order to get a zinc free solution of sodium hydrosulphite, it is necessary to eliminate the zinc from this compound by double decomposition with hydrated lime, according to the equation:

$$Na_2S_2O_4 + ZnSO_3 + Na_2SO_3 + Ca(OH)_2 = Na_2S_2O_4 + Zn(OH)_2 + Na_2SO_3 + CaSO_3 \qquad (2)$$

The zinc hydrate and calcium sulphite, being rather insoluble, are removed by filtration, and a solution of sodium hydrosulphite and sodium sulphite results, which may be used for dyeing indigo. Pure solid hydrosulphite may be salted out as the unstable hydrate, $Na_2S_2O_4 2H_2O$. By dehydrating this compound above 50 deg. Cent., separating the anhydrous salt, and drying it *in vacuo*, the article of commerce is obtained.

Referring again to the equation (1), you will notice that for every four molecules of sodium bisulphite used, there is only one molecule of hydrosulphite formed. In other words, only one-half of the SO_2 is utilized. In order to utilize more of it, an acid may be added to transform the sodium sulphite, formed as a by-product, back into sodium bisulphite, and thus utilize it again, according to equation:

$$3NaHSO_3 + Zn + HCl = NaCl + Na_2S_2O_3 + ZnSO_3 + 2H_2O \qquad (3)$$

or

$$6NaHSO_3 + 2Zn + H_2SO_4 = Na_2SO_4 + 2Na_2S_2O_4 + 2ZnSO_3 + 2H_2O$$

I am told that this reaction actually was used by textile people, but our own experience shows that it is difficult to carry out correctly on account of the strength of the muriatic or sulphuric acid. But the SO_2 efficiency is raised from 50 to 66 2-3 per cent. It is better to use SO_2 in the equation (3) as in:

$$2NaHSO_3 + SO_2 + Zn = Na_2S_2O_4 + ZnSO_3 + HO$$

where the SO_2 efficiency is again 66 2-3 per cent.

The way it is actually made on a factory scale is by the action of zinc on a water solution of SO_2, according to the formula:

$$Zn + 2SO_2 = ZnS_2O_4, \qquad (4)$$

where all the material is used. The zinc is eliminated in this case by caustic soda or soda ash, and the filtrate contains sodium hydrosulphite, which is worked up in the same manner, as described before, or used immediately.

It took us many years to develop a satisfactory yield, because the hydrosulphite in solution is a very unstable compound. It is extremely liable to oxidation through the contact with air, especially so in water solution, as in the equation:

$$Na_2S_2O_2 + O = Na_2S_2O_5 \qquad (5)$$

Even in the absence of air it undergoes a decomposi-

tion into sodium bisulphite and sodium thiosulphate:

$$2Na_2S_2O_4 = Na_2S_2O_3 + Na_2S_2O_5 \qquad (6):$$

and, while you may have a fairly good yield, in the morning, you will be surprised to see how little of it is left in the afternoon.

The curves I have brought along with me will illustrate this point very clearly. The first chart shows the loss in strength (1) of a pure hydrosulphite solution but under oil. You will notice that after a couple of hours the curve commences to drop quite sharply. Perhaps you have noticed that yourself, while you were working with the liquid hydrosulphite that you made yourselves. The next curve (2) will show you that the drop in strength is not quite so pronounced, if the hydrosulphite solution is kept alkaline and away from the air as it should be. Nevertheless the drop in strength is very great—about 35 per cent loss. Consequently, when using a self-made solution, you are never sure just how much actual hydrosulphite is present unless you analyze constantly. (3)

Any of the solution that happens to be left over in the evening had best be discarded and actually is most of the time, which constitutes another serious loss. On the other hand, your solid hydrosulphite will not lose any more in strength during six months than does your hydrosulphite solution in one hour. And that fact alone explains why it is possible to turn out goods of exactly the same shade, penetration and fastness at any time, whereas these factors will be vastly different if liquid hydrosulphite be used.

For all vat dyes, except Indigo, the solid product is always used, chiefly for this reason; only for the cheapest grade of Indigo dyed goods would the home-made hydrosulphite solution be considered, for you

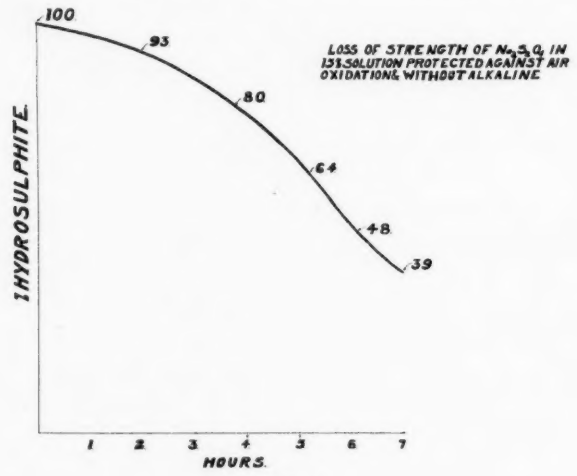

FIG. 1

all know that the shade, penetration and fastness of Indigo depends to a large extent on the amount of hydrosulphite and free caustic present. If you are working with a solution of hydrosulphite, you start your run in the morning with the proper amount of hydrosulphite and caustic, insuring good penetration and fastness. As the day wears on, the strength of your hydrosulphite drops and at the same time some of your caustic is neutralized by the bisulphite formed (5 and 6); in consequence the shade goes off and the penetration and the fastness to rubbing become less.

Of course, I do not deny that these factors can be allowed for either by guessing or by analytical control. If by guessing, it takes a very experienced and seasoned operator to get good uniform results. If controlled by analysis, it is very difficult and would cost lots of time. In fact, I don't believe analytical control feasible.

I have been told that there is another great advantage in using the solid hydrosulphite in dyeing indigo in being able to better control the amount of water going into the dye vat. If you are using solution, you are constantly adding quite a large amount of water to your vat, which prevents you from entering the goods in the wetted-out state for fear the volume of the bath would get too large. On the other hand, when using the solid hydrosulphite, you can enter the goods thoroughly wetted out without fear of increasing the volume of your vat.

It is chiefly for these reasons that a number of the large textile concerns, who formerly attempted to make their own hydrosulphite solution, have gradually abandoned it in favor of the solid product. The solid concentrated product is now of such a stable nature and so uniform in composition, and results in such uniformly good production that it would seem foolish to burden the textile man with a pretty complex chemical manufacturing problem, when he has enough troubles of his own.

Besides, for vat dyeing, the hydrosulphite of soda is greatly used for stripping dyes from textiles, and for bleaching straws. It may be of interest to you also to know that very large quantities of hydrosulphite of soda are used for bleaching soap stock and molasses, and smaller amounts in the manufacture of arsphenamine.

The sodium salt of hydrosulphurous acid, sodium hydrosulphite, is the only representative of the hydrosulphites that is sold in commercial quantities. Other salts are described in the literature, such as the potassium, lithium, ammonium, magnesium, calcium, strontium, zinc, cadmium and tin salts.

The second group of the hydrosulphites consists of those compounds that are formed out of the hydro-

sulphites by the reaction with formaldehyde. Of this group the sodium sulphoxylate formaldehyde is the chief representative. It had been observed around the year 1900 that the hydrosulphites combined very easily with formaldehyde to give substances that are

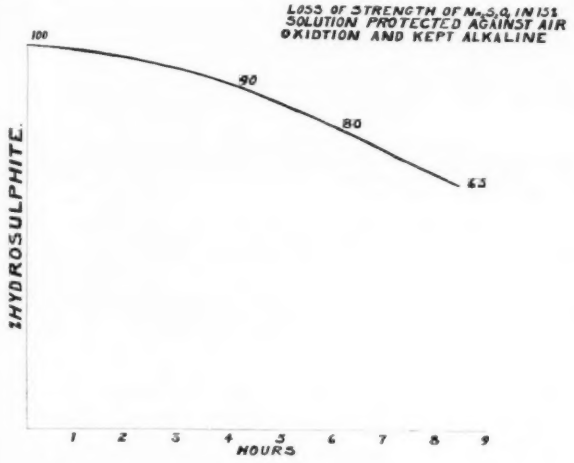

FIG. 2

more stable to heat, and at the same time retain their strong reducing reaction.

The formula for the formation of these addition products is:

$$Na_2S_2O_4 + 2CH_2O = NaH.SO_2.CH_2O + NaH.SO_3CH_2O \quad (7)$$

In other words, every molecule of hydrosulphite gives you one molecule of sulphoxylate formaldehyde, and one molecule of bisulphite formaldehyde. The bisulphite formaldehyde has no strong reducing properties. The sulphoxylate compound, however, is the chemically valuable one, and may be extracted from this mixture of salts by the use of alcohol, in which the sulphoxylate formaldehyde is insoluble and the bisulphite formaldehyde soluble. Technically, however, this process is unsatisfactory, and I think that all of the sodium sulphoxylate formaldehyde on the market to-day is made by a different process, the formulation of which is still rather uncertain.

However, it must be more or less analogous to the reaction which gives us sodium hydrosulphite, only complicated by the addition of formaldehyde at the moment of its formation. In this way a solution of sodium formaldehyde sulphoxylate is obtained, which must be filtered off from the zinc compounds of the reaction. This is done by the usual methods of mechanical filtration and yields a brilliantly clear solution of sodium formaldehyde sulphoxylate, which is then boiled down *in vacuo* to the desired consistency, and then drawn off into pans in which it congeals to hard cakes. These cakes are then reduced mechanically to any size lumps that the trade demands; for instance, to walnut size, pea size or powder.

As you will observe, there is no chance of any hard substances, such as sand or grit, to be in the finished article, since it is filtered very carefully and boiled down in a closed kettle in a vacuum.

I am mentioning this point to make a little digression from our subject to-night. It had been thought for some time that in some way or other sodium formaldehyde sulphoxylate was the cause of the scratching of the copper rolls and the nicking of the doctor blade in printing. At the annual meeting last year this question was discussed from all angles; and it seemed to be the prevailing opinion that it was caused almost every time by grit that had got into the printing paste.

The hypotheses of salts crystallizing out in the paste or an electrolysis, which deposited copper crystals onto the doctor blade, were mentioned, but without much faith in their correctness.

Since then, Mr. Helwig of our laboratory has gone into the matter further, and by investigating such pastes, that had actually caused scratching, although they were strained in the regulation way through muslin several times, it was easy to prove that some grit had passed all these strainings.

The explanation of this was rather obvious. The bags of flannel or muslin, containing the paste, are always squeezed or wrung to make the paste pass through more rapidly; and, in so doing, particles of very fine grit were forced through the yielding meshes of the cloth. If such paste is diluted sufficiently, the

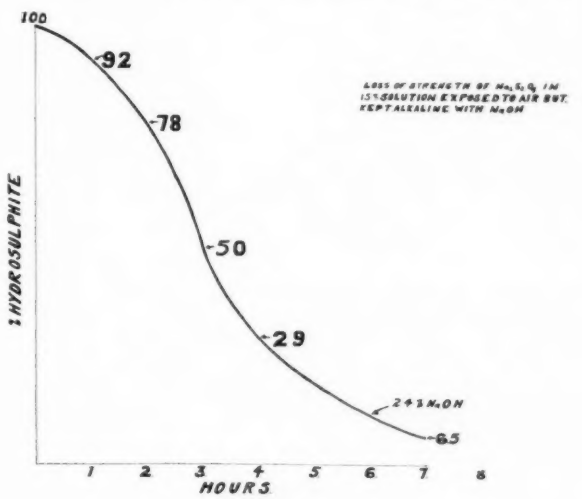

FIG. 3

grit will separate out at the bottom, and can be easily distinguished.

Another method of proving this is to filter the undiluted paste through a filter medium that will *not* yield, such as metallic filter cloth. If this is done, the grit particles will remain on the metallic filter cloth.

In every observed case it was a fine, siliceous grit which scratched the microscope slide and had caused the scratching of the rolls and the nicking of the doctor blade.

Our advice, therefore, in order to insure perfectly smooth printing pastes is to filter them through an unyielding filter medium, such as metallic filter cloth.

The origin of the fine grit is in all likelihood dust from the street or from the cement floors or else from the various raw materials entering the pastes.

Sodium formaldehyde sulphoxylate is used in large quantities, as you know, for textile printing. Besides, it is used in the bleaching of molasses, in stripping colors from textile fibers, and a small amount in the manufacture of Neoarsphenamine.

Sodium sulphoxylate formaldehyde also was made during the war by a good many print shops themselves, but this has been largely abandoned, because they were not able to get liquors of the right concentration for a good deal of their printing work. Besides, the price has come down to such a low figure, that it hardly pays them to manufacture it themselves.

There are many salts of formaldehyde sulphoxylic acid described in the literature, but only two others, beside the sodium salt, have gained technical importance. These two are both zinc salts.

The one of the formula, $ZnOH.HSO_2CH_2O$, basic zinc sulphoxylate formaldehyde—is insoluble in water, but soluble in acids and alkalies. It is, however, always used in acid solution, preferably with formic and acetic acid, but also with sulphuric, very largely for stripping shoddy and other textile fibers. It is always shipped out in very finely ground form to insure its speedy solution in acids. The acid solution is boiled with the rags or other fabrics to be stripped, until the colors are bleached.

The other compound is the normal zinc sulphoxylate formaldehyde $Zn(HSO_2CH_2O)_2$. It is soluble in water, has the strongest reducing power per pound of substance of any of these hydrosulphites and sulphoxylates, and is also used in conjunction with acids for stripping shoddy and other textile fibers. It has found here lately an interesting application in the printing of wool and silk goods.

In concluding, I may say that the method of analaysis of these compounds has been described by Helwig in the American Dyestuff Reporter, October, 1920.

Discussion

[Note.—*After presenting the foregoing paper Dr. Hollander answered the questions in the following discussion:*]

Q.—Will you be kind enough to tell us the names of the two salts you just described?

A.—The original trade names the German manufacturers gave to these were Decrolin and Sol. Decrolin. The former is insoluble and the latter is freely soluble.

$$Zn<\begin{matrix}OH\\HSO_2.CH_2O\end{matrix} \quad \text{(Decrolin)}$$

$$Zn<\begin{matrix}HSO_2.CH_2O\\HSO_2.CH_2O\end{matrix} \quad \text{(Sol. Decrolin)}$$

Q.—Why do they call it hydrosulphite when the formula is $Na_2S_2O_4$ and there is no hydrogen in it at all?

A.—This was an error made in the first formula. When Schuetzenberger first isolated the product he gave it the formula $NaH\,SO_2$ and called it hydrosulphite and that name has stuck to it until now.

Q.—Will hydrosulphite stripping agents strip sulphur colors?

A.—Sulphur colors behave exactly like vat colors. You can reduce them very easily like all other vat compounds, but the color will come back little by little. Sulphur dyes are always dyed on cotton goods and, as you know, sulphur dyes are very easily destroyed by chlorine, so chlorine is the thing to take, i. e., a hypochlorite solution. It always gives good results with sulphur dyes.

Q.—What relationship does leucotrope bear to hydrosulphite?

A.—Leucotrope is not a hydrosulphite but it is often confused with it. It is used with sodium hydrosulphite to prevent Indigo White from reoxidizing too readily after it has been discharged. Leucotrope O gives a yellow discharge, and Leucotrope W a white. Leucotrope O is a dimethylphenylbenzylammonium chloride. Leucotrope W is a calcium salt of sulphonated Leucotrope O.

Q.—Do you know about what proportion of leucotrope you put in the hydrosulphite?

A.—That varies a great deal. It varies with the shade of your Indigo and also with the type of pattern. It is very easy to standardize the proportion but it is not in the interest of the people who use it to use a set formula. It is better to gauge your own requirements and save the fairly expensive leucotrope that way.

Q.—What is the percentage strength of sodium hydrosulphite?

A.—The commercial product is always 90 per cent; i. e., if it is full strength. (Laughter).

Q.—What is the reaction between caustic soda and hydrosulphite in vat dyeing?

A.—There is no reaction between the two. The caustic

is only there to hold your leuco compound in solution; i. e., the leuco compound is insoluble in water, but is soluble in the presence of caustic soda. Indigo is insoluble in water and so is Indigo White, but the Indigo White is soluble when you add alkali to it. The caustic protects the hydrosulphite from breaking down by autocatalyzation. The hydrosulphite when it decomposes always gives you bisulphite, and that bisulphite of course is acid, and hydrosulphite is decomposed in acid solution. It breaks down very, very quickly, and you know when you add acid to a solution of hydrosulphite you get a yellow color immediately. That yellow color is said to be the color of the solution of the hydrosulphurous acid. Whether or not it is, I cannot tell, because nobody ever isolated it. Some claim that the yellow color is due to the formation of colloidal sulphur.

Q.—What uses up your caustic soda in dyeing?

A.—You see, you are constantly forming bisulphite when you reduce your vat dye. That means that you are oxidizing your hydrosulphite. When you oxidize the hydrosulphite you get bisulphite and that bisulphite is neutralized by your caustic and that is why the caustic disappears.

Q.—Can you tell about how much hydrosulphite you would have to use to reduce an Indanthrene color, knowing the formula and molecular weight of the color, also the formula of the leuco compound?

A.—You could figure it out but it all depends on the conditions of your dyeing, and I believe that the theory will not help you very much there. I think the dye formulas are all worked out in an empirical way to show that you just have enough all the time to keep your dye in a soluble condition.

Q.—Is it known definitely what the leuco compounds of the vat colors are?

A.—Yes, I do not know them all as well as you do, I am sure, but you know that when you reduce Indigo you get a fairly colorless compound—sort of yellowish. I think when you reduce G. C. D. it is blue (practically the same color), then there is a yellow Indanthrene that is reduced to blue, but all those leuco compounds are well known chemically and formulas known for them.

Q.—What part does sodium sulphide play; i. e., what action does it have on hydrosulphite in dyeing vat colors?

A.—I think that the presence of the sulphide has a protecting action on the leuco compounds in that they do not reoxidize so fast. We found, for instance, that if you add sodium sulphide to your indigo bath and dip a piece of filter paper in the bath, the indigo bath containing sulphide will stay greenish and not oxidize to blue as fast as the one that does not contain sodium sulphide. I think in certain cases it would be very beneficial.

Q.—Would not an excess of caustic do the same thing?

A.—Yes. If you have a great deal of caustic in your indigo bath it delays the reoxidation and I think you get lighter shades but much faster shades and better penetration.

Q.—Does hydrosulphite decompose very readily from exposure to air?

A.—It depends upon how much moisture there is. I am surprised to see samples that are sent us in paper envelopes arrive in as good condition as they do. Hydrosulphite is not as sensitive as you would think, but for analytical purposes, you cannot expose it two or three minutes before you get quite a falling off in strength. On the whole, it keeps fairly well as long as you do not keep it in a wet dyehouse for a long time. If you want good results, you should keep it in a dry, cool room with the lid closed and handle it the quickest way possible.

Q.—Does formaldehyde hydrosulphite decompose as rapidly as hydrosulphite?

A.—Much slower. It is not decomposed until you raise it to the boiling point. All hydrosulphites, no matter what they are, are sensitive to moisture, especially in hot summer weather.

Q.—What do you consider the best analytical method of testing the hydrosulphites and sulphoxylates? Do you use the iodine method?

A.—We never use that. It can be used but iodine will give no results on sodium hydrosulphite because it titrates the bisulphite as well. We always prefer to use the copper sulphate method. This is described in the October, 1920, issue of the AMERICAN DYESTUFF REPORTER. We advise to take that method first of all because you use the same solution for both the hydrosulphites and the sulphoxylates and it is easy to procure, cheap, and gives good results.

Q.—Is there any way that hydrosulphite can be used to strip down a combination of mohair and cotton to get the mohair down to a snow white?

A.—Using hydrosulphite you could not get it away from a canary yellow. Do you know whether the dye used on the mohair contained any yellow dye of the Primuline type? There are some dyes, like Primuline, that will not discharge under any circumstances.

Q.—This mohair was not dyed at all—it was just in the natural color.

A.—The natural color of hair or wool cannot be stripped with hydrosulphite. You can temporarily, perhaps, get it down but the color will return.

Q.—Is there any hydrosulphite used in the manufacture of Indigosol?

A.—I have no idea. You see, that is more or less of a secret, as it is a new product. Of course, when you dye the Indigosol you need no hydrosulphite, but you must employ an oxidizing agent. With Indigosol you can obtain fastness of vat dyes on piece goods and yet have perfect discharges.

Q.—Can you get a completely fast ground?

A.—Yes, you can.

Q.—What hydrosulphites are best for stripping chrome colors?

A.—The average chrome colors are very hard to strip. If you can strip them at all, you are unable to get rid of your chrome bottom, which will remain. However, quite a number of chrome dyes can be partially stripped with hydrosulphite.

Q.—Is that the product they use for cleaning dye tubs, etc.?

A.—The best thing to use for that would be hydrosulphite.

Q.—What is the best chemical to use if you want to oxidize your dye bath instantaneously? Some people use peroxide, some use perborate and some use an acid.

. . . Discussion followed as to the merits of chrome and acid, perborate and peroxide as oxidizing agents. The first choice was oxidation by air. Chrome and acid was favored by some as the cheapest and strongest, but fear was expressed of its being too strong. The speaker raised the question as to whether peroxide would not be better than perborate because of its greater available oxygen at a price close to that of perborate.

WILLIAM D. LIVERMORE

William D. Livermore, for thirty-seven years chief chemist of the American Woolen Company, passed away at his home in Lawrence, Mass., on Friday, October 22, after several months of failing health.

Mr. Livermore was born in Charlestown, Mass., and received a technical education at the Massachusetts Institute of Technology. After his graduation he was first employed as second hand in the dyehouse of the Silver Spring Bleachery & Dyeing Company at Providence, R. I. Two years later he was appointed chemist of the Washington Mills, Lawrence, Mass., at a time when chemical laboratories in textile mills had not fully established their importance. When, ten years later, this mill was consolidated with others in the organization of the American Woolen Company, Mr. Livermore became chief chemist of the new company, holding this position until his death.

He was regarded by contemporary members of his profession as one of America's foremost authorities on textile chemistry and as the leading chemist of the woolen and worsted industry. His valuable work on the Research Committee of the American Association of Textile Chemists and Colorists, of which he was vice-president, formed an important contribution to the activities of that body. In all his endeavors in the chemical field he was guided by the praiseworthy ideal that the textile chemists of this country should bend every effort toward raising the standard of American goods.

In addition to his connection with the above-mentioned association, Mr. Livermore was a member of the American Chemical Society and a charter member of the Merrimack Valley Country Club.

Besides his widow and a large circle of friends and associates to mourn his loss, he leaves his mother and one son, William T. Livermore. By his business acquaintances as well as by his intimate friends he will long be remembered as a man of untiring industry, quiet refinement and sterling character.

Changes of Address

Bell, Edward B., 78 West Street, Keene, N. H.

Benedix, August, Kew Arms 6F, Metropolitan and Lefferts Avenue, Kew Gardens, L. I.

Booth, Herbert, 175 West Seventy-sixth Street, New York City, N. Y.

Chapin, Edward S., 1003 Park Avenue, Plainfield, N. J.

Duhring, Edwin L., Standard Ultramarine Company, Huntington, W. Va.

Estey, P. F., 171 Irving Avenue, Providence, R. I.

Everist, Thomas B., Harman Bleachery, Holmesburg, Pa.

Farron, Joshua, Jr., Dunn Worsted Mills, Woonsocket, R. I.

Feindel, George P., 101 Whiting Avenue, E. Dedham, Mass.

Goldman, Moses H., 36 Connecticut Avenue, Washington, D. C.

Graves, A. Newton, 195 George Street, Providence, R. I.

Hilton, Wilfred, Box 325, Garnerville, Rockland County, N. Y.

Hornby, Bertrand L., P. O. Box 124, Chattanooga, Tenn.

Jaeger, Robert W., 5520 Kenwood Avenue, Chicago, Ill.

Lincoln, Warren L., 1715 Commonwealth Avenue, Boston, Mass.

Martin, John b., 333 Adelphi Street, Brooklyn, N. Y.

McNeil, John, care of Clark Thread Company, Bloomfield, N. J.

Micheles, Leo M., 209 Underhill Avenue, Brooklyn, N. Y.

Robbins, Wm. K., 686 Hall Street, Manchester, N. H.

Sampson, Albert E., 65A Charles Street, Boston, Mass.

Schmatzler, Karl H., National Aniline & Chemical Company, 113 High Street, Boston, Mass.

Schug, Walter, Textile Converting Works, Inc., 1012 Willow Avenue, North Bergen, N. J.

Shreve, R. Norris, manufacturing and consulting chemist, 50 E. Forty-first Street, New York City, N. Y.

Smith, Thomas, Jr., 75 Pleasant Street, Manchester, N. H.

Sturtevant, Harold B., Bellman Brook Bleachery Company, Fairview, N. J.

Tarpey, T. J., D. K. House, 115 Mt. Vernon Street, Lowell, Mass.

Watson, John C., 107 Oak Hill Avenue, Pawtucket, R. I.

Wilmot, Harrison F., 308 Adelphi Street, Brooklyn, N. Y.

Wisdom, Roy H., Domingo Dyewood Corporation, 42 Broadway, New York City, N. Y.

ANNUAL MEETING, DEC. 3-4, CHARLOTTE, N. C.

The following letter about the Annual Meeting has been prepared by the committee on participation from the North, which includes: Elvin H. Killheffer (chairman), Newport Chemical Works, Passaic, N. J.; John F. Bannan, M. T. Stevens & Sons Company, North Andover, Mass.; Ralph F. Culver, Ciba Company, Peck Street, Providence, R. I.; Hugh Christison, Arlington Mills, Lawrence, Mass.; Herbert Grandage, Clark Thread Company, Newark, N. J.; Daniel P. Knowland, Geigy Company, 89 Barclay Street, New York City; Robert E. Rose, E. I. du Pont de Nemours & Co., Wilmington, Del.

A copy of this letter is being sent to every member of the Association. Members should not fail to fill out the card enclosed with the letter and return it as soon as possible. Without this co-operation from members the work of the committees planning the details of the annual meeting will be greatly delayed.

October 28, 1926.

Dear Fellow Member:

Arrangements are now as complete as they can be made until we have a definite promise from you:

a. That you are going to the meeting.
b. Telling us which, if any, of the side trips you will want to take advantage of.
c. Banquet.

Railroad Accommodations.

We have secured a special rate applicable to members of our Association and their families, this rate being a full fare to Charlotte and a half fare returning. The one-way fare from New York to Charlotte is $21.44. Fares from Boston, Providence, Philadelphia, etc., are correspondingly higher or lower as the case may be. The charge for a lower berth is $6.75, upper berth $5.40, and a drawing room $24.00.

This special tariff rate providing for reduced railroad fare is applicable not only to the North and East, but to all territories from which our members will come to Charlotte. *Members of Southern section please take note.*

To take advantage of this reduced fare the procedure is as follows: You buy your ticket to Charlotte from the ticket agent in your city, or town, telling him that you are a member of our Association and want to take advantage of the reduced rate provided for this meeting. He will then give you with your ticket a certificate and in Charlotte at the meeting you have this certificate signed by Mr. Hadley our Secretary and validated by a representative of the railroad company who will be there. This validated certificate will then enable you to buy a return ticket for half price. In case the ticket agent from whom you buy your ticket going disclaims knowledge of the special rate you can tell him that he will find it by looking up his special fare bulletin number CP 126. The first day the tickets can be purchased under this tariff is November 29 and the last day they can be used returning is December 8.

Official Meetings.

On Friday evening, December 3, there will be an open forum as well as a smoker and entertainment provided by the Southern Section. Saturday, December 4, will be given over entirely to a general meeting of the Association with presentation of various papers and a discussion of them. Speakers and subjects will shortly be announced by the Council. Saturday evening will be the annual banquet of the Association, tickets for which will be $5.00. Speakers will include Dr. Louis A. Olney, President of the Association; Edwin Farnum Greene, Treasurer of the Pacific Mills; Col. Herman A. Metz, President of General Dyestuff Corporation, and Dr. D. W. Daniel of Clemson College.

Side Trips.

Various mills in Greensboro, Salisbury and Charlotte, N. C., and Greenville, S. C., have invited members of the Association to visit them and make an inspection of their plant. The following alternatives are, therefore, provided.

1. Greenville, South Carolina.

   Those wishing to visit mills in Greenville, S. C., should leave New York on the 3.40 p. m. train on Wednesday, December 1. They would arrive in Greenville around noon on Thursday, would be taken care of and spend the night in Spartanburg and be brought back to Charlotte, visiting plants en route, so as to get back to Charlotte in

time for Friday night's meeting. The places to visit at Greenville will include Judson Mills, Franklin Process Company and probably several others, as well as Pacific Mills, en route back to Charlotte.

2. Greensboro and Salisbury, North Carolina.
   Those wishing to visit mills in this section should leave New York on Thursday on the 1.10 p. m. or 3.40 p. m., arriving in Greensboro Friday morning. They should then be shown around some of the large mills in Greensboro, traveling by bus to Salisbury and thence by bus to Charlotte. The visits here will include such places as White Oak Cotton Mills and Proximity at Greensboro and Salisbury Cotton Mills at Salisbury.
3. Charlotte and vicinity.
   Those wishing to visit these mills leave New York at the same time as those making the Greensboro visit, except that they will go directly to Charlotte, arriving there 6.30 a. m. and 8.50 a.m., respectively. Visits here will include such plants as Highland Park Manufacturing Company.

The Southern section must know several days in advance as to the numbers who wish to visit these various centers.

A return postcard is enclosed herewith. Be sure to fill this out and return promptly.

Yours very truly,

ELVIN H. KILLHEFFER,
Vice-President.

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red. yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

WALTER E. HADLEY,
5 Mountain Avenue,
Maplewood, N. J.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

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Vol. XV November 1, 1926 No. 18

PENNY WISDOM IN THE DYEHOUSE

THE dye in a blue serge suit costs only a little more than a dime. In a dress of Georgette crepe the dye is worth two cents. These significant figures are part of the United States Tariff Commission's report on its study of the cost of dyes in fabrics and garments.

Statistics are not always dull; they are always important when supported by authority. These dye cost figures have back of them the authority of a disinterested Federal commission. They are important and they should not be dull to any thoughtful person.

The plain facts concerning dye costs rest on the data compiled by the commission in its canvass of thirty-two mills, and they sift down to this conclusion, quoted from the report:

> In general, the cost of dyes is a small part of the total cost of a fabric or garment. . . . The difference in cost between fugitive and fast dyes is so slight, especially when compared with the cost of the fabric on which they are used, that the universal use of fast dyes should be encouraged.

The only possible reason why fast dyes are not used in larger quantities is that the cost of the dye is considered by the pound instead of by the yard. Indigo, we will admit, is one of the most widely used dyes, and it is a good fast color. But the selection of other dyes is apparently too often made in defiance of that well-worn platitude "Penny wise and pound foolish."

Vat dyes costing from one to two dollars or more per pound may seem expensive—like a seventy-five-cent cigar. But when a large broad-silk plant quotes the cost of its dyes at one and one-half cents *per yard* for the year, is it not clear that each pound of dye does a tremendous amount of work for the dollar or so that mill pays for it?

We begin to see from this that the cost of the dye in a yard of silk broadcloth or in a madras shirt is far below its actual value in helping to sell the fabric or garment. Particularly is this obvious when we reckon the dye cost in relation to the selling price of the cloth at two dollars per yard, or of the finished dress at twenty or thirty times that price.

Strict economy in mill operation is praiseworthy and in full accord with modern methods of manufacture. But knowing when and where to economize is even more worth while. There may be some sound excuse for economizing in the more expensive supplies used in the mill, but there is scarcely any practice that will more quickly injure the good reputation of one's fabrics than economizing on dyes. The Tariff Commission's report emphasizes that fact better than anything yet published on the subject. It should be read and remembered by every buyer of dyestuffs.

AN ALL-BRITISH CHEMICAL TRUST

MERGERS among European industries in the past year indicate that the United States has no monopoly of monopolies. The exchange of shares among the four large British chemical firms—Nobel Industries, Brunner, Mond & Co., United Alkali Company and British Dyestuffs Corporation—is one of the most important action ever taken in British industry. The capitalization of this group will be about $500,000,000. At least two of its members control other combinations. Nobel Industries is said to own stock in General Motors Corporation in this country and to comprise in itself a merger of thirty explosive companies. The British Dyestuffs Corporation recently assumed control of Scottish Dyes, Ltd.

This merger should make England's chemical industry stronger than it ever has been. It cannot justly be called a combination in restraint of trade, for the modern tendency to group allied industries does not spring so much from a desire to restrain trade as to pool interests for the common good. The British dye and chemical users no doubt will at first look upon such a huge trust with suspicion; but if the trust conforms to the business ethics followed by contemporary industrial fusions, the consumers will reap the benefit in better chemical products and service.

It may, and probably will, weaken the position of the smaller dye makers in the country. But at least they can console themselves with the thought that it is still a British controlled industry; and that, after all, is the important thing.

BUSY TEXTILE MILLS

PREDICTIONS of business authorities, reviewing conditions at the beginning of the last quarter of the year, agree that the outlook for industry is en-

couraging. To quote from the National City Bank's economic report:

> Weighing the evidence from all quarters, it is apparent that the industrial machine is geared up to high speed and is running smoothly. While taking full satisfaction in this, there is still need for a steady hand upon the wheel and a clear eye ahead. The uncertainties regarding agriculture, together with the dependence of our present prosperity on the building and automobile industries, make it clear that the present is no time for the relaxation of vigilance or the abandonment of those conservative policies that have proved their worth in the past.

The distinctly louder hum in the textile sections of the country should sound like music to those whose trade depends on conditions in that industry and who have until a few weeks ago felt somewhat pessimistic as to the remainder of the year.

Quickened production has not confined itself to cotton. Archer Wall Douglas, writing on current conditions, says that the principal woolen mills are fully booked with orders as the result of drastic cuts in the price of wool fabrics. These concessions bring to an end the long-drawn-out resistance to the former higher prices by both dealers and consumers. It seems to have been an instance where the leaders of a great industry finally concluded that it was wiser to go with the wind than to beat against it any longer.

Some are even so optimistic about the textile trade as to say that its upward trend, with consequent greater employment, may offset in some measure the effects on general business of prospective declines in activity elsewhere.

After the prolonged dullness in the textile industry, this stability will exert an immediate effect on all related lines of trade. To the dyestuff and mill chemical trade it should be a stimulus to more intensive selling effort as the year comes to a close.

UNITED STATES CHEMICAL TRADE HOLDING ITS OWN

The United States exports and imports of chemicals and allied products nearly balanced in August, 1926, the former aggregating $15,170,000 and the latter, $15,690,000, according to the Chemical Division of the Department of Commerce. Whereas little change (a 0.3 per cent decline) was recorded in the exports as compared with August, 1925, a 6 per cent loss was made in the imports, which reflected several noteworthy variations, chief of which were a 31 per cent drop in gums and resins, a 22 per cent decline in fertilizers, and an 85 per cent advance in coal-tar products.

The most significant change in the coal-tar products trade was the 85 per cent increase in imports which attained a value of $2,338,000 for the month. Dead or creosote oil was mainly responsible for the increase, but this was due in part to the exceptionally small receipts last August as well as to larger shipments this month, total imports for August, 1926, having been $1,503,200 (10,682,200 gallons). The imports of colros, dyes, and stains, amounting to $622,800 (554,900 pounds) exceeded many of the other months but were not conspicuously large, especially when it is recalled that the receipts in July, 1926, were notably small.

The exports of coal-tar products also showed a gain, but only 8 per cent, and were less than one-half the imports, or a total for the group of $1,076,700 for August, 1926. More benzol left the country this August than last or $427,000 (11,341,000 pounds). The exports of dyes struck about the monthly average of the year but failed to reach August, 1925, value although they exceeded the quantity, total shipments having been 2,448,700 pounds, worth $472,400.

DR. TEEPLE TO BE AWARDED 1927 PERKIN MEDAL

Dr. John E. Teeple, chemist, of New York City, has been selected as the 1927 recipient of the Perkin Medal, awarded "annually to the American chemist who has most distinguished himself by his services to Applied Chemistry," in recognition of his significant scientific, technical and administrative achievements, particularly the economic development of an American potash industry at Searles Lake, California.

The Committee on Award consisted of representatives of the five leading scientific societies: Society of Chemical Industry (British), American Section; American Chemical Society; American Electrochemical Society; American Institute of Chemical Engineers; Societe de Chimie Industrielle (French), American Section.

The medal will be awarded at a public meeting to be held at Rumford Hall, Chemists' Club, New York City, on January 14, 1927, under the auspices of the participating societies. It will be presented by the senior past president of the Society of Chemical Industry resident in America, Dr. William H. Nichols.

Dr. Teeple was born in Kempton, Ill., January 4, 1874, was graduated from Valparaiso (Ind.) College in 1894, and received the degree of Doctor of Philosophy from Cornell University in 1903, since which time he has been engaged in consulting chemical practice in New York City. He has been treasurer and director of the American Chemical Society since 1919, and has held various offices in other scientific societies of which he is a member. He was president of the Chemists' Club from 1921 to 1923. Dr. Teeple is an authority on Maya Inscriptions, and has contributed numerous articles to the American Anthropologist.

The acute shortage of potash supplies during the World War brought about by the blockade of German ports led to efforts to secure potash from the brines of Searles Lake, California. This effort at first proved

unavailing because of faulty engineering and contamination of the potash with sufficient borax to injure agricultural crops. After the expenditure of large sums of money the British owners of this property placed the whole matter in the hands of Dr. Teeple, who successfully worked out the scientific problems involved. To the results of this research he then added the fine engineering sense which led to the installation of improvements by which was gained potash at a cost which would compare favorably with European potash, and free from borax. The hitherto injurious borax was then developed into an important output of the plant and is adding largely to the world's supply of this important material.

As a result of this work the British owners have placed sufficient funds at his disposal to double the capacity of the plant, and it is now capable of supplying 20 per cent of the potash needs of the country, in addition to the large quantities of borax that are constantly being marketed. In the midst of a desert, Dr. Teeple has developed a modern and efficient plant whose operations are carried out under the guidance of a fine research staff.

TEXTILE AND CHEMICAL INDUSTRIES IN RED CROSS CAMPAIGN

In accordance with the Red Cross Roll Call campaign plan of committee organization of New York City, various industrial, mercantile, professional and banking groups will carry the Roll Call appeal into every branch of industry. Special Roll Call groups, under volunteer chairmen, will function to cover intensively the textile and chemical industries to enlist the maximum response to the forthcoming annual Roll Call, which opens on Armistice Day, November 11.

In the textile field Alexander Walker, of Strong, Hewat & Co., heads as volunteer chairman a special woolens groups, with E. J. Swords, of the same company, acting with him as assistant chairman. Charles Whitney Dall, of Ridley Watts & Co., is chairman of the cottons group; Charles Pinnell, president of Fred Butterfield & Co., chairman of the cotton converters group, and Louis Stearns, of John N. Stearns & Co., chairman of the silks group.

Col. Herman A. Metz will serve as section chairman of a special dyestuffs and chemical section, and will organize to function with him a committee of five subchairmen to cover intensively the various groups in this section. Colonel Metz will personally supervise the dyestuffs group. Charles L. Huisking, of Charles L. Huisking Company, will head the manufacturing chemists, and G. E. Wharry, manager of F. R. Smead Company, will head the oils, paints and varnish group. Similar groups will cover heavy chemicals and essential oils under Colonel Metz's section.

These groups will be among approximately 200 such groups which it is anticipated will be functioning throughout the city by the opening of the Roll Call period, and which will represent a total of some 4,500 volunteer chairmen, committeemen and captains covering practically every phase of the city's life.

Aid for disabled ex-service men is a primary responsibility of the Chapter, and various forms of help for the veteran and his dependents constitute a large part of the Red Cross work. More than 4,000 wounded veterans, men still in service, and members of their families were aided during the year, the annual report states, and in the home service department new and recurrent cases were reported as having increased 43.2 per cent in a two-year period. Legal assistance, money loans and medical advice are included in the work.

Other outstanding metropolitan activities are the disaster relief and public health program, under which more than 616,000 surgical dressings were supplied to hospitals of the city, and which also covers nursing service, first aid, and work in home hygiene and care of the sick.

BOOKS OFFERED BY THE CHEMICAL FOUNDATION

The meritorious work of the Chemical Foundation in spreading knowledge in popular form on the subject of chemistry, and particularly on the American chemical industry, goes forward steadily. The set of five books selected by the American Chemical Society as a comprehensive survey of modern chemistry for the layman continues to be one of the Foundation's most attractive offers, comprising as it does that technical classic "Creative Chemistry," by Edwin L. Slosson; "The Riddle of the Rhine," by Lefebure; Gregory's "Discovery, the Spirit and Service of Science"; "Life of Pasteur," by R. Vallery-Radot, and "The Future Independence and Progress of American Medicine in the Age of Chemistry." Several thousand copies of the two volumes "Chemistry in Industry" have been sold, along with the companion volume "Chemistry in Agriculture," while "What Price Progress?," by Hugh Farrell, continues to be of the greatest interest to students of research as well as to investors.

The Westvaco Chlorine Products Company, of New York City, has announced the adoption of a group insurance program covering about 150 employees for a total of approximately $160,000 life insurance, as well as health and non-occupational accident protection providing liberal weekly benefits. A feature of the program is the co-operative arrangement under which it is being underwritten by the Metropolitan Life Insurance Company. This provides for the payment of premiums jointly by the employer and employees, whose share of the cost is in this way reduced.

According to statistics compiled by the National Safety Council, employees who have worked in an industrial establishment less than one year, are most likely to be injured. Employers should be sure to instruct new workers regarding the hazards attendant on their particular jobs.

RECENT LITERATURE

Dyeing with Coal Tar Dyestuffs. By C. M. Whittaker, B.Sc. Second edition. 248 pages. Illustrated. D. Van Nostrand Company. $3.50.

The first edition of this work was published eight years ago and twice reprinted. It is quite needless to go into detail about the radical changes that have all but revolutionized the textile industry, nor dwell long on the various recent improvements in dyeing and printing and textile chemistry. Few textbooks on dyeing that came out a decade ago are of much value today. Constant revision, republication, is necessary if the literature of dyeing is to be kept from becoming a dusty, curious, antiquated pile of books.

In the new edition the author has enlarged his treatise on "the principles involved and the methods employed" to include chapters on the dyeing of artificial silk and the application of the solubilized vat dyes and of other series added to in range. It is thus brought up to date.

The first part, a general survey of dyeing, will undoubtedly still be interesting to the new generation of students as a background against which they may view more clearly the dyeing industry of to-day and its requirements.

The arrangement of the text is the same as in the first edition. The classes of dyes are thoroughly explained in eight chapters. In each a brief but complete description of their structure precedes the exposition of their uses. The dyeing of unions is treated separately, as is the application of colors by oxidation. Thirty pages are devoted to a lucid, comprehensive treatment of rayon dyeing, with formulaes and lists of applicable dyes. The concluding chapter deals with the valuation and detection of dyestuffs.

Clear, terse, non-theoretical, this book remains as one of the most useful texts of its kind. It is a readable and informative introduction to the entire field of dyeing.

TECHNICAL BOOK CATALOGUE

Pratt Institute Library, Brooklyn, N. Y., has issued a booklet containing a selection of the best technical books of 1925 on every subject that can even be remotely considered as technical. Only one or two books are listed under each classification, which simplifies the task of choosing one to suit one's needs. It was thus necessary to omit mention of many more good books, but the selection as it stands will be useful.

Dye Production Increased 25 per Cent, Census Shows

Data Given on Cost of Dyes in Garments—Dye Prices Decline—Imports and Exports Up in 1925

THE production of coal tar dyes by seventy-five manufacturers in this country last year was 25 per cent greater than that of 1924, according to a preliminary report of the United States Tariff Commission covering the high spots in the ninth annual Census of Dyes and Other Synthetic Organic Chemicals.

A new and very important feature of this latest dye census is the results of the Tariff Commission's painstaking investigation on the cost of dyes in representative garments and fabrics. Data on dye costs were carefully collected from thirty-two domestic textile concerns; the complete findings, published in this report, make interesting reading.

Many other significant facts are included in the summary of the 1925 dye census. A decline of 13 per cent in the prices of domestic dyes during last year was concomitant with the increase in production. There were fewer manufacturers last year, several firms closing down in the press of greater domestic competition. A record production of vat dyes is announced, with a 43 per cent increase in this class of colors over the 1924 output. Both imports and exports of dyes were also considerably higher than in the previous year. The details of these activities in the domestic industry as well as an important survey of the international dye trade are given below.

Cost of Dyes in Fabrics and Garments

In the latter part of 1925 the Tariff Commission collected data from thirty-two domestic textile concerns on the cost of dyes in fabrics and garments, including those of cotton, woolen, worsted and silk.

The following summary table gives the cost of the dyes used in a variety of garments and fabrics. The costs of the dyes are considered in each instance representative of the kind of article for which they are quoted. There are, however, certain fabrics showing a cost above and other fabrics showing a cost below the figures given. The methods employed in computing these costs are given in the Commission's report.

Description of garment or suit—	Cost of dye in cents
Cotton	
Men's overalls, denim, indigo dyed, per pair	1.70
Men's working shirts, chambray, indigo dyed, per shirt	0.20
Men's shirts, woven striped madras dyed with	
Vat dyes, per shirt	1.00
Sulphur dyes, per shirt	0.25
Men's shirts, cotton shirting printed with	
Vat dyes, per shirt	1.25

Basic and chrome colors, per shirt	0.25
Soldier's cotton khaki suit, dyed with sulphur dyes, per suit	3.00
Woolen and Worsted	
Men's suit, 14-oz. blue serge worsted, per suit	11.00
Police uniform, navy or police cloth dyed with Indigo and Alizarine, per suit	18.00
Men's woolen suit, 14-oz., mixed color, per suit	7.00
Men's overcoat, 20-oz., overcoating mixed color, per overcoat	16.00
Women's fancy worsted, 10-oz. serge, per suit	9.00
Women's fancy worsted, silk stripe serge, 10-oz., per suit	15.00
Women's overcoat, Bolivia cloth, 20-oz , per overcoat	28.00
Silk	
Silk dress, plain silk (9 yards per pound), per dress	4.00
Silk dress, georgette crepe (18 yards per pound), per dress	2.00
Hat	
Men's felt hats, per hat	1.25

The cost of the dye required varies widely for light shades as compared with dark shades, and also in accordance with the weight of the fabric to be dyed. Therefore, the average cost of dye per yard means little unless full detail is given as to the type of fabric and color used. Nevertheless, the figures from some of the largest plants in the United States illustrate the general range of the costs of dye on the yardage basis.

The cost of dye in three cotton piece-dyeing plants for the year ended July 1, 1914, amounted to one-eighth cent per yard. During the calendar year 1918, a year of peak prices, the same three plants had a cost of one-half cent per yard. Data obtained by the Tariff Commission from three cotton piece-dyeing plants for 1924 and 1925 show the cost of dye per yard of about one-third of a cent. The cost of dye per yard for broad silks for one large plant in 1925 was 1.5 cents per yard as compared with 5 cents during the war period.

Four silk piece-dyeing plants showed for 1924 and 1925 an average cost of 0.65 cents per yard for dyes and three silk printing establishments show for the same period a dye cost per yard of 0.94 cent.

Cost of Dye Extremely Small

In general, the cost of the dye is a small part of the total cost of a fabric or garment. In view of the rapidly increasing demand by the ultimate consumer of textiles for fast-dyed fabrics and the introduction by many textile firms of trade-marked fabrics, which are guaranteed as to color, the difference in cost per yard between the fugitive and the fast dyes is of interest.

Men's woolen and worsted suitings and overcoating materials are very largely dyed in the United States with dyes of excellent fastness. Women's woolen and worsteds for suitings and overcoatings are not as a rule dyed with as fast colors as are used for men's wear.

In the field of cotton fabrics, there has been a conspicuous increase in the use of vat dyes on account of their high fastness to washing, light and the chlorine bleach used in the modern laundry. In the case of men's shirts of woven-striped madras, a representative cost of dye per yard per shirt, using the fast vat dyes, is one cent per shirt, as against 0.25 of a cent when sulphur dyes are used which are soon bleached out by the chlorine in laundering. The average cost per yard for dyes on cotton piece goods, such as broadcloth and ladies' cotton suiting, dyed with vat dyes, was about 3½ cents per yard compared with about one-half cent per yard for the direct dyes which do not stand washing, light, and certain other destructive agents. The difference in cost between fugitive and fast dyes is so slight, especially when compared with the cost of the fabric on which they are used, that the universal use of fast dyes should be encouraged.

The silk industry, as compared with the cotton and wool industries, has been a relatively small consumer of fast dyes in the past. Brilliancy and purity of shade have been emphasized rather than fastness to washing, light, and perspiration. The phenomenal increase in the use of silk for women's wearing apparel has resulted in a demand for washable silk which does not require the expensive drying cleaning process. In response to this, the use of the developed direct dyes is increasing and the woven color effects, vat-dyed yarn is becoming an important factor in the silk industry.

Dye Production Increased 25 Per Cent

The output of coal-tar dyes by seventy-five firms was 86,345,438 pounds in 1925, as compared with 68,679,000 pounds in 1924. The total sales in the two years were 79,303,451 pounds, valued at $37,468,332, and 64,961,433 pounds, valued at $35,012,400, respectively. The increased production is in part due to the improvement of the export trade of which Indigo and Sulphur Black are the principal items. More than 90 per cent of the total quantity of dyes consumed in the United States in 1925 were of domestic manufacture, and certain of the lower-priced colors were exported in significant amounts. The progress of the industry during that year is manifest not only in increased output, but in the production for the first time in the United States of many vat dyes, direct developed dyes, alizarine derivatives, and special colors for dyeing rayon and certain mixed fibers.

Decline in Domestic Dye Prices

The weighted average price of all domestic dyes sold was about 13 per cent less in 1925 than in 1924. The price in 1925 was 47 cents per pound, as compared with 54 cents in 1924 and $1.26 in 1917. Price recessions in

1925 were general, occurring in the low as well as the high-priced dyes. They were largely due to the severe competition between the domestic manufacturers and in the high-priced colors to increased competition from imported dyes.

Reduction in Number of Manufacturers

Seventy-five firms reported production of dyes in 1925 (six of which made only bacteriological stains and indicators). In 1924, seventy-eight firms reported, and in 1919, ninety firms. By the end of 1925, four firms had ceased production and one was taken over by another firm, leaving sixty-four manufacturers of dyes exclusively). The severe competition resulting from excess capacity to produce will, in the long run, eliminate many of the existing firms. It is likely that some of the smaller ones will be absorbed by the larger, and that several others will amalgamate in order to lower manufacturing costs by a reduction of selling expenses, duplication, and overhead.

The number of dye producers in the United States affords an interesting contrast to the situation in Germany and Switzerland. In Germany six firms have been taken over by the Badische, now known as the I. G., leaving two other large producers and perhaps four of minor importance. In Switzerland, three of the four producers have a close affiliation of interest.

Record Production of Vat Dyes

Vat dyes other than Indigo recorded a peak production, with a total of over 2,600,000 pounds, or an increase of 43 per cent over the 1924 figure. The total output of vat dyes including Indigo was 31,730,000 pounds, as compared with 21,818,000 pounds in 1924. The marked annual increase in the consumption of vat dyes is in response to the insistence of the ultimate consumers of textiles for fast-dyed fabrics. Trade-marked fabrics with a color guarantee are becoming an important item in the trade and insure the consumer of a fabric attaining a standard of fastness. Vat colors have been very largely used on cotton; especially on fabrics subjected to the treatment of the modern laundry. The application on silk, however, is assuming more importance each year.

Dye Imports Increase

The total imports of coal-tar dyes for 1925 were 5,209,601 pounds valued at $4,637,240, representing a 72 per cent increase by suantity and a 59 per cent increase by value over the 1924 figure. Germany furnished 52 per cent of the imports and Switzerland 32 per cent, the remainder originating from other countries. Competition from imported colors, principally the high-cost types, has been pronounced. These consist largely of vat dyes, alizarines, developed direct dyes and dyes covered by foreign patents. This competition has increased since the tariff reduction of 15 per cent on September 22, 1924.

Dye Exports Increase

Exports in 1925 totaled 25,799,889 pounds valued at $6,694,360, an inccrease of 64 per cent in quantity and only 19 per cent in value over 1924. Indigo and Sulphur Black were the leading dyes exported. Some direct dyes and a limited quantity of other types were sold abroad. Severe competition in the world markets has resulted in price reductions in nearly every important consuming country.

International Dye Trade in 1925

The year 1925 was marked by energetic efforts on the part of Germany to regain her former dominance of the world's dye markets. A trust known as the I. G. Teerfarben Industrie was formed by the consolidation of six German dye producers. This is one of the most ambitious undertakings in the history of German finance, and is primarily intended to reduce manufacturing costs. A second project was the consolidation of the foreign sales agencies, the purpose of which is to increase the competitive strength of the German Cartel in each of the foreign markets.

In 1925, the exports of German dyes amounted to 75,879,025 pounds, valued at $44,311,155, an increase of 24 per cent in quantity and 43 per cent in value over 1924. By value the 1925 exports were 85 per cent and by quantity 32 per cent of the pre-war 1913 figure. In certain tonnage dyes Germany has encountered competition from the new producing countries. In the high-priced products, she has been successful in increasing her export trade, to both producing and non-producing nations.

The world's capacity to produce dyes greatly in excess of demand continued and has brought about severe competition in the world's markets with a downward trend in price. The new producing nations, regarding dye manufacture as a key industry and essential to national defense, have adopted protective measures with a view to stimulating dye manufacture. Competition, however, will undoubtedly reduce the capacity in coming years to a figure more nearly at the pre-war level, allowing for increases in population and per capita consumption.

In Great Britain the government has withdrawn from participation in the affairs of the British Dyestuffs Corporation with the result that there has been a writing down of the assets of the corporation and reduction in its capital. In 1925 the corporation took over the Scottish Dyes, Ltd., a concern that is pre-eminent in the manufacture of vat dyes in that country.

Italy has made progress in the manufacture of new dyes, and Spain has recently adopted a system of dye license control for the protection of the home industry. Japan, following the system of dye import control, adopt-

ed in 1924, and the Subsidy act in March, 1925, has extended the provisions of its subsidy to firms producing certain dyes. Russia, in an effort to establish a dye industry, is now producing certain shades, intermediates, and dyes. The export trade of Switzerland shows in 1925 a loss in the exports of Indigo but a slight increase in both values and quantity for dyes other than Indigo.

SEPTEMBER DYE IMPORTS

(*Continued from page 714*)

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
873	681	Direct Gray R Paste—(G)	981
875	923	Fur Black—(Q) Fur Black DF—(IG) Fur Blue Black A—(IG) Fur Brown—(Q) Fur Brown NZD—(IG) Fur Dark Brown—(Q) Fur Gray ALA—(IG) Fur Yellow Extra—(Q)	1,150
884	627	Anthracyanine S—(DH)	110
892	635	Modern Violet—(DH)	220
924	660	Methylene Green W—(G)	5,291
926	661	Thionine Blue GO—(G)	1,000
1027	778	Alizarine Red VI Old Paste—(IG) Alizarine Red VI Extra Pure—(IG)	4,850
1033	779	Alizarine Orange AO Paste—(BD)	388
1035	782	Anthracene Brown SW Powder—(IG)	200
1037	783	Purpurine—(By)	3,840
1039	785	Alizarine Red GI Paste—(IG)	441
1040	784	Alizarine Red SX Paste—(IG)	1,257
1053	—	Alizarine Sapphire Blue SE—(I)	440
1054	858	Alizarine Light Blue B—(S)	7,000
1060	801	Anthracene Blue SWGG Powder—(B)	200
1064	—	Alizarine Cyclamine R Paste—(IG)	1,199
1073	852	Alizarine Direct Violet ER—(B)	100
1075	856	Alizarine Blue AS Powder—(By) Alizarine Astrol B Powder—(By)	1,658
1077	860	Alizarine Direct Blue BGAOO—(IG)	1,000
1078	865	Alizarine Cyanine Green G Ex. Pdr.—(IG)	500
1080	853	Anthraquinone Violet Powder—(IG)	500
1084	854	Alizarine Viridine FF Paste—(IG)	1,985
1088	855	Alizarine Sky Blue B Powder—(By)	441
1089	861	Anthraquinone Blue SR Ex. Pdr.—(IG)	300
1081	—	Alizarine Rubine GW Powder—(By) Alizarine Rubinot 5G Powder—(IG) Alizarine Rubine R Powder—(By)	762
1095	759	Anthra Yellow GC Paste Fine—(IG) Anthra Yellow GC Powder (s. s.)—(IG)	6,213
1096	760	Vat Golden Orange G Powder (s. s.)—(B)	800
1097	761	Vat Orange RRT Paste—(IG)	2,390
1104	767	Vat Brilliant Violet RR Paste Fine—(IG) Vat Violet RR Ex. Dbl. Pst. (s. s.)—(B)	3,615
1109	840	Vat Blue 3G Paste—(IG) Vat Blue 3G Paste Fine—(IG)	1,919
1111	844	Vat Blue 5G Powder (s. s.)—(By)	2,400
1113	842	Cibanone Blue GCD Dbl. Pst. (s. s.)—(I) Vat Blue GCD Dbl. Pst. (s. s.)—(B) Vat Blue GCD Dbl. Pst. Fine (s. s.)—(M) Vat Blue GCDN Powder (s. s.)—(IG)	23,688
1114	—	Paradone Blue FC Paste—(LBH) Vat Blue BCS Powder (s. s.)—(B)	3,371
1118	849	Vat Yellow G Double Paste (s. s.)—(B)	1,906
1120	867	Anthra Brown B Paste—(M)	50
1131	816	Vat Red 5GK Powder (s. s.)—(By)	1,600
1132	817	Vat Red GK Powder (s. s.)—(By)	3,200
1133	819	Algol Red R Ex. Powder (s. s.)—(IG)	2,400
1145	834	Vat Gray BK Paste—(By)	10
1149	873	Vat Brown GR Paste—(IG)	300
1150	833	Vat Olive R Paste—(IG)	2,000
1151	—	Vat Brown R Paste—(IG)	1,999
1152	—	Vat Brown B Paste—(GrE) Vat Brown B Powder (s. s.)—(GrE) Vat Brown G Paste—(IG) Vat Brown G Powder (s. s.)—(IG)	7,974
1163	832	Vat Violet BN Powder (s. s.)—(B)	800
1169	792	Cibanone Orange R Powder (s. s.)—(I)	3,528
1172	794	Cibanone Black B Paste—(I) Cibanone Black 2G Powder (s. s.)—(I)	2,862
1178	876	Indigosol O	100
1184	881	Brilliant Indigo BASF 4B Paste Fine—(IG) Brilliant Indigo 4B Powder (s. s.)—(B)	5,496
1190	885	Brilliant Indigo B Paste—(IG)	5,125
1209	917	Helindone Red B Powder (s. s.)—(IG)	250
1212	918	Ciba Red 3B Paste—(I) Ciba Red 3B Powder (s. s.)—(I)	4,521
1218	915	Vat Scarlet R Paste—(IG)	300
1228	907	Anthra Scarlet GG Paste Fine—(IG) Anthra Scarlet GG Powder (s. s.)—(Q) Thioindigo Scarlet 2G Paste—(IG)	5,730
1229	908	Ciba Red R Paste—(I)	6,612

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Anthracene Red 5BL—(By)	100
Acid Rhodamine BG—(IG)	250
Acid Violet 1R Extra—(IG)	100
Alizarine Astrol Violet B Powder—(IG)	75
Alizarine Brilliant Sky Blue R—(IG)	75
Alizarine Direct Blue A—(M)	200
Alizarine Light Blue AR Conc.—(S)	178
Alizarine Supra Blue A Powder—(IG)	1,000
Brilliant Acid Blue EG—(IG)	500
Brilliant Acid Blue G—(I)	1,653
Brilliant Acid Blue FF—(By)	492
Brilliant Milling Blue B—(C)	
Brilliant Milling Blue B—(IG)	940
Brilliant Milling Blue FG—(IG)	100
Brilliant Scarlet N—(IG)	500
Brilliant Wool Blue FFR Extra—(IG)	1,250
Cloth Fast Red 3B—(I)	220
Erioglaucine XFF Pure—(G)	110
Fast Acid Green 2B Extra—(IG)	1,000
Guinea Fast Red 4BL—(A)	123
Indocyanine B—(A)	1,166
Ink Blue BITBN—(IG)	2,000
Levelling Silk Blue B—(IG)	500
Milling Orange G—(IG)	200
Milling Yellow H3G—(IG)	20
Neolan Orange R—(I)	551
Novazol Blue B—(G)	551
Pilatus Fast Blue BR—(IG)	100
Pilatus Fast Blue G—(IG)	300
Pilatus Fast Green BL Conc.—(IG)	50
Pilatus Fast Yellow GR—(IG)	100
Polar Red B Conc.—(G)	551
Soluble Blue T—(IG)	200
Sulphon Orange G—(By)	572
Sulphon Yellow R—(By)	397
Supramine Black BR—(IG)	500

Name of Dye and Manufacturer	Quantity (pounds)
Supramine Blue FB—(IG)	200
Supramine Red B—(IG)	500
Supramine Yellow R—(IG)	200
Wool Fast Orange G Powder—(By)	272
Xylene Milling Red B Conc.—(S)	100

Vat Dyes

Anthra Orange RH Paste Fine—(IG)	500
Anthra Scarlet G Paste Fine—(IG)	100
Ciba Pink BG Paste—(I)	
Ciba Pink BG Powder (s. s.)--(I)	4,740
Cibanone Bordeaux B Powder—(I)	220
Grelanone Red 3BR Paste—(GrE)	309
Helindone Blue 3G Powder—(IG)	100
Helindone Printing Black RD Paste—(IG)	4,000
Hydron Brown G Paste—(IG)	
Hydron Brown G Powder (s. s.)—(C)	
Hydron Brown R Paste—(IG)	3,854
Hydron Navy Blue C Paste—(IG)	200
Hydron Pink FF Paste—(IG)	
Anthra Pink R Extra Powder (s. s.)—(B)	1,600
Hydron Scarlet 3B Powder (s. s.)—(C)	1,980
Hydron Violet BBF Paste—(IG)	200
Hydron Violet RE Paste—(IG)	100
Indanthrene Brown GG Paste—(By)	1,619
Indigosol AZG—(DH)	55
Indigosol O4B—(DH)	
Indigosol O4B—(By)	640
Indigosol OR—(DH)	110
Indigosol Red HR—(DH)	55
Indigosol Scarlet HB—(DH)	55
Indigosol Violet AZB—(DH)	110
Indigosol Yellow HCG—(DH)	110
Paradone Gray B Paste—(LBH)	2
Thioindigo Black B Paste—(K)	420
Vat Blue Green B Double Paste Fine (s. s.)—(IG)	2,002
Vat Brilliant Blue R Paste Fine—(IG)	
Vat Brilliant Blue R Powder (s. s.)—(IG)	2,249
Vat Brown R Paste—(Q)	352
Vat Golden Orange 3G Paste—(IG)	1,191
Vat Gray RRH Paste Fine—(IG)	
Vat Gray RRH Powder (s. s.)—(IG)	1,281
Vat Green GG Double Paste (s. s.)—(IG)	1,980
Vat Printing Brown R Paste—(By)	1,135
Vat Printing Red G Paste—(IG)	200
Vat Yellow Brown 3G Paste—(IG)	
Vat Yellow Brown 3G Powder (s. s.)—(IG)	1,800
Wool Vat Brown 3R Paste—(By)	100

Mordant and Chrome Dyes

Acid Chrome Red B—(IG)	200
Alizarine Fast Gray 2BL Powder—(IG)	1,000
Alizarine Light Violet RS Conc.—(S)	1,000
Chromazurine DN—(DH)	110
Chrome Printing Orange BW—(DH)	22
Chromocitronine 3R—(DH)	110
Chromoxane Pure Blue B—(By)	1,140
Eriochromal Brown G Powder—(G)	110
Eriochromal Gray 5G Conc.—(G)	220
Eriochrome Black E—(G)	1,102
Eriochrome Blue Black G—(G)	2,205
Eriochrome Phosphine RR—(G)	551
Eriochrome Violet 3B—(G)	220
Metachrome Blue Black 2BX—(IG)	500
Metachrome Brown 6G—(IG)	200
Modern Blue CVI—(DH)	220
Modern Gray PS—(DH)	22
Naphthochrome Violet R—(I)	2,204

Direct Dyes

Benzo Chrome Blue Black B—(IG)	100
Benzo Chrome Brown B—(IG)	300
Benzo Fast Black L—(IG)	1,200
Benzo Fast Blue 8GL—(IG)	1,500
Benzo Fast Bordeaux 6BL—(By)	505
Benzo Fast Brown GL—(IG)	100
Benzo Fast Brown 3GL—(IG)	1,100
Benzo Fast Brown RL—(IG)	1,200
Benzo Fast Heliotrope 4BL—(By)	1,196
Benzo Fast Yellow RL—(IG)	1,762
Benzo Red 12B Powder—(By)	398
Benzo Rhoduline Red B3B—(IG)	800
Benzoform Yellow GL—(IG)	100
Brilliant Benzo Green B—(IG)	400
Brilliant Congo Violet R—(A)	500
Brilliant Copper Blue GW—(IG)	25
Brilliant Pure Yellow 6G—(IG)	500
Brilliant Sky Blue 8G Extra—(By)	1,877
Brilliant Sky Blue R—(By)	200
Brilliant Sky Blue 2RM—(By)	4,331
Chicago Red III—(G)	3,307
Chlorantine Fast Blue 2GL—(I)	771
Chlorantine Fast Blue 4GL—(I)	110
Chlorantine Fast Blue 8GL—(I)	2,315
Chlorantine Fast Bordeaux 2BL—(I)	1,543
Chlorantine Fast Green B—(I)	1,102
Chlorantine Fast Violet 5BL—(I)	771
Chlorantine Fast Violet RL—(I)	4,408
Chlorazol Drab RH—(BD)	200
Chlorazol Fast Orange AG—(BD)	1,000
Columbia Catechine G—(IG)	500
Developing Blue B—(IG)	200
Diamine Azo Brown 3G—(C)	391
Diamine Azo Light Yellow 2G—(C)	441
Diamine Brilliant Scarlet S—(IG)	500
Diamine Catechine 3G—(IG)	250
Diamine Fast Orange EG—(IG)	500
Diamine Fast Orange ER—(IG)	500
Diaminogene Blue GG—(C)	3,598
Diazanil Pink B—(IG)	200
Diazo Brilliant Blue 2BL Ex.—(IG)	500
Diazo Brilliant Green 3G—(IG)	
Diazo Brilliant Green 3G—(By)	1,051
Diazo Brilliant Scarlet 2BL Ex.—(By)	254
Diazo Brown BW—(I)	220
Diazo Brown G—(By)	478
Diazo Brown 3G—(By)	496
Diazo Brown 3RW—(I)	110
Diazo Green 3G—(By)	497
Diazo Indigo Blue 2RL—(IG)	200
Diazo Rubine B—(IG)	1,051
Diazo Sky Blue B—(By)	1,653
Diazo Sky Blue 3GL—(By)	838
Diphenyl Brown BBNC—(G)	1,102
Paper Yellow GGX—(IG)	1,500
Pluto Black G Extra—(By)	500
Rosanthrene B—(I)	661
Rosanthrene RN—(I)	1,653
Toluylene Fast Brown 2R—(By)	200
Triazol Fast Brown 3GL—(GrE)	165
Zambesi Black D—(IG)	500
Zambesi Black V—(IG)	
Zambesi Black V—(A)	1,000

Dyes for Artificial Silk

Name of Dye and Manufacturer	Quantity (pounds)
Blue Extra Paste—(IG)	200
Cellit Fast Orange G—(IG)	50
Dispersal Yellow 3G—(BD)	188
Duranol Blue G Paste—(BD)	284
Ionamine H—(BD)	20
Ionamine L—(BD)	60
Ionamine Blue B—(BD)	120
Orange Extra Paste—(IG)	100
Red R—(IG)	100

Rapid Fast Dyes

Rapid Fast Red GL Paste—(IG)	1,000

Basic Dyes

Brilliant Rhodamine Blue R Powder—(By)	454
Rhodamine 6GDN (s. s.)—(IG)	2,500

Sulphur Dyes

Pyrogene Green GK—(I)	1,543
Thional Brilliant Blue 6B—(S)	500
Thional Black XXN Conc.—(BD)	100
Thional Brown R—(BD)	2,240
Thional Green B—(BD)	6,970

Spirit Soluble and Color Lake Dyes

Hansa Green GS—(IG)	400
Hansa Yellow G Paste—(IG)	2,000
Hansa Yellow 5G Powder—(IG)	500
Helio Black—(IG)	100
Helio Bordeaux BL Powder (s. s.)—(By)	2,310
Helio Fast Green HGS—(By)	25
Helio Fast Violet AL—(By)	200
Helio Fast Yellow GL Paste—(By)	5
Oil Green ALB in Lumps—(IG)	25
Paper Fast Bordeaux B—(IG)	400
Tero Black FB—(IG)	100
Tero Yellow FR—(IG)	500

Unidentified Dyes

Whitex Washing Blue—(Q)	23,800
All other dyes—(IG)	1

A LIST OF APPRAISEMENTS OF COAL-TAR PRODUCTS WITHIN PARS. 27 AND 28 OF THE TARIFF ACT OF 1922

The following supplemental list contains the month of entry, the name of the product within paragraphs 27 and 28, together with the designations as "C" (for competitive) and "NC" (for non-competitive), which indicates the appraisement basis for the assessment of the ad valorem duty in paragraphs 27 and 28 of the Tariff Act of 1922.

The ad valorem rate for competitive dyes is based on the American selling price as defined in Subdivision (f) of Section 402 of Title IV; the ad valorem rate for non-competitive dyes is based on the United States value, as defined in Subdivision (d) of Section 402 of Title IV of the Tariff Act of 1922.

This list contains the appraisements received since the publication of the August list for the port of New York, beginning with January, 1926.

JANUARY

Acid Ponceau E640	NC
Acid Red G Conc	NC
Anthra Scarlet B Paste	C
Beibrich Scarlet R Medic	C
Brilliant Milling Blue B	NC
Diamine Azo Fast Green G	NC
Diaminogene Blue GG	NC
Erio Fast Fuchsine BBL 649	NC
Eriochrome Brown SWN Supra 1061	NC
Fast Wool Blue GL Powder	NC
Indocyanine B Powder	NC
Poseidon Blue BR Extra	NC
Rhodamine B Conc. 762	C
Rhodamine Blue 6B Conc	NC
Setacyl Direct Orange 2R Powder 788	C
Setacyl Direct Red B Powder 789	NC
Silk Blue BSIC Powder 100%	C
Sulphide New Blue BL	NC
Vat Brown 3R Paste	NC
Vat Khaki GG Paste	NC
Vat Pink FB Paste	NC
Vat Red Violet RH Paste	NC

FEBRUARY

Acid Alizarine Gray G	NC
Acid Milling Red G Conc. 631	C
Anthra Pink R Extra Paste	C
Brilliant Pure Blue B Powder	NC
Chromal Blue GC for Printing 939	NC
Chrome Azurol S Conc. 1004	NC
Diazophenyl Black V 360	C
Diphenyl Black Base I	NC
Diphenyl Brown BBNC	C
Diphenyl Fast Brown GNC 129	NC
Diphenyl Fast Gray BC 254	NC
Erio Green B Supra	C
Eriochrome Azurol BC	NC
Eriochrome Cyanine RC 935	NC
Eriochrome Red G	NC
Eriochrome Yellow G Paste	C
Erio Glaucine AP 545	NC
Erio Glaucine EP 548	NC
Helindone Gray IGK Powder	NC
Indigo MLB/6B Powder	C
Methyl Silk Blue New 706	NC
Polar Gray 699	NC
Polar Red G Conc	NC
Rhodamine B Conc. 762	C
Setacyl Direct Blue R Powder 782	NC
Thio Indigo Rose BN Extra Paste	NC
Vat Blue GCD Double Paste Fine	C
Vat Blue 3G Powder	C

MARCH

Acid Pure Blue R Supra 614	NC
Brilliant Acridine Orange R Conc	NC
Brilliant Milling Blue B	NC
Cotoneral A Extra	NC
Diamine Azo Brown G	NC
Diaminogene B 100%	NC
Diaminogene GG	NC
Dianil Fast Violet BL	NC
Eosamine G	NC
Fast Black G Conc. 280 60%	NC
Fur Blue Black SDF	NC
Fur Zrown NZD	NC
Fur Brown SKG	NC
Fur Gray G	NC
Fur Olive 3G	NC
Guinea Brown 2GL	NC
Guinea Fast Green 3B	C
Hansa Yellow G Paste	NC
Helindone Blue 3G Powder	NC

Helindone Orange R Paste	C
Hydron Blue R Powder	NC
Indo Cyanine B	NC
Metachrome Red G	NC
Metachrome Violet B	NC
Methylene Heliotrope Extra	NC
Milling Yellow O	NC
Phosphine O	NC
Polar Red G Conc. 596 70%	NC
Tero Yellow FR	NC
Vat Red Brown R Paste	NC

APRIL

Acid Blue RBF	NC
Acid Magenta	NC
Alizarine Direct Blue RXO Powder	NC
Alizarine Red W Powder	C
Alizarine Sky Blue B Powder	NC
Anthra Yellow GC Paste	NC
Basic Pure Blue BO	NC
Benzo Chrome Brown B	NC
Benzo Fast Scarlet 4BS	C
Brilliant Pure Yellow 6G Extra	NC
Ciba Bordeaux B Paste	NC
Ciba Red R Paste	NC
Cibanone Blue GCD Double Paste	C
Cibanone Blue 3G Paste	NC
Congo Orange R	NC
Danubia Blue BX	NC
Diazo Fast Blue 6GW	NC
Euchrysine RRDX	C
Excelsior Yellow 12G	NC
Fast Cotton Brown 4RL	NC
Fur Blue Black SB	NC
Fur Gray B	NC
Fur Olive 6G	NC
Kiton Fast Yellow 3G	C
Lake Yellow RF Conc	NC
Metachrome Violet B	NC
Milling Orange G	NC
New Methylene Blue NS Conc	NC
Patent Phosphine G	C
Patent Phosphine R	C
Runic AL Conc	NC
Sulphon Cyanine G	NC
Vat Olive R Paste	NC
Vat Red BK Powder	C
Vat Red Brown R Paste Fine	NC
Victoria Pure Blue BO	NC

MAY

Acid Cyanine BF	NC
Acridine Yellow AO	NC
Alizarine Red S Powder	C
Anthra Red B Paste	NC
Chloramine Yellow FF Conc	C
Developed Brilliant Green 3G	NC
Diaminogene GG Powder	NC
Diazo Fast Blue 2GL	NC
Fur Blue Black SA	NC
Fur Brown NZD	NC
Guinea Fast Green 3B	C
Helindone Pink AN Paste	NC
Indocyanine FF	NC
Metachrome Brilliant Blue BL	NC
Milling Orange G	NC
Patent Blue V	C
Thio Indigo Orange R Paste	C
Viridine Lake 1026H Powder	C
Xylene Fast Green B Conc	C

JUNE

Alizarine Light Blue B	C
Alizarine Light Blue B Conc	C
Alizarine Light Blue SE Conc	C
Alizarine Light Green GS Conc	C
Alizarine Sapphire Blue B	C
Alizarine Sapphire Blue SE	C
Blue Extra Powder	NC
Blue FF Powder	NC
Chlorantine Fast Bordeaux 2BL 56%	NC
Chlorantine Fast Gray B 98%	NC
Chlorantine Fast Green B 82%	NC
Chlorantine Fast Orange 2RL 69%	NC
Chrome Azurine G 65%	NC
Chrome Printing Orange 2R Powder 79%	NC
Ciba Red R Paste 20%	NC
Ciba Scarlet G Extra Paste 20%	NC
Cibanone Blue 3G Paste 10%	NC
Cibanone Red G Powder 85%	NC
Cibanone Red G Powder 85%	NC
Diaminogene GG	NC
Diazo Brown BW 45%	NC
Fast Green Extra Bluish Powder	NC
Kiton Blue A 82%	C
Kiton Fast Red 4BL 75%	NC
Madder Lake VN 14 Powder	C
Metachrome Olive Brown G Powder	NC
Methylene Green Extra Conc	C
Neolan Blue G 42%	NC
Neolan Green B	NC
Neolan Pink B 42%	NC
Neolan Pink G 38%	NC
Neolan Yellow G 30%	NC
Patent Phosphine G 87%	C
Pyrogene Green 3G 78%	C
Rosanthrene Fast Red 7BL 54%	C
Rosanthrene Orange R 67%	NC
Toner Black 35 St. Powder	NC
Vat Black B Paste for Printing	NC
Vat Brown R Paste	NC
Vat Scarlet G Extra Paste	NC
Vat Yellow GC Powder	NC
Xylene Blue AS Conc	C

JULY

Alizarine Light Blue B	C
Alizarine Light Blue B Conc	C
Alizarine Light Blue SE Conc	C
Alizarine Sapphire Blue SE	C
Brilliant Bordeaux S	NC
Brilliant Chrome Blue S Powder	NC
Brilliant Sulphon Red B	C
Chloramine Red B	C
Chloramine Red 3B	C
Chromazurine DN	NC
Chrome Fast Green G	NC
Chromorhodine 6GN Extra	NC
Ciba Yellow G Paste	NC
Cibanone Blue 3G Paste	NC
Cibanone Orange 6R Powder	C
Diaminogene GG	NC
Eosin Pure	NC
Eosin Azur	NC
Fluorescein	C
Fuchsine Basic	NC

Gentian Violet Pure	NC
Green Stain	NC
Guinea Blue A4B	NC
Guinea Blue V4B	NC
Guinea Brown 2GL	NC
Guinea Carmine B	NC
Guinea Green B	NC
Indanthrene Blue GCD Double Paste	C
Indigo Carmine Test Indicator	C
Indo Violet BF	NC
Madder Lake 71 Extra Powder	C
Metachrome Brown BL	NC
Metachrome Brown 6G	NC
Metachrome Olive B	NC
Metachrome Yellow RA	NC
Methyl Orange T/I	C
Methylene Blue Pure	NC
Milling Yellow R	NC
Neolan Blue B 46%	NC
Ortho Cerise B	NC
Red Stain	NC
Rhodamine G Extra	C
Romanowsky Stain	NC
Sandothrene Blue GCD	C
Sandothrene Yellow NC	C
Trisulfon Brown 2G Conc	C
Vat Black B Paste for Printing	NC
Vat Yellow 3GN Powder	NC
Victoria Blue R Base	NC
Viridine Lake 1028 H Powder	C
Xantho Acridine MO	NC

AUGUST

Green Stain	NC
Romanowsky Stain	NC
Whitex Washing Blue	NC

SEPTEMBER

Whitex Washing Blue	NC

TWO NEW PONTAMINES ANNOUNCED

The dyestuffs department of E. I. du Pont de Nemours & Co. has recently developed and placed on the market two additions to its line of Pontamine colors, under the names Pontamine Fast Orange ER and Pontamine Diazo Scarlet 2BL.

The orange product has been used for many years for producing bright shades of orange on yarns and cotton piece goods. It is described as very level dyeing and suitable for use with other Pontamine colors, such as Fast Orange EG, Fast Black LN and Fast Red 8BL. It is particularly desirable for producing mode shades with the above dyestuffs on the padder. The fastness products of Pontamine Fast Orange ER are said to be excellent for a direct color. On silk and cotton unions the silk is practically unstained, and on cotton and Celanese unions the Celanese is unstained.

The second color, Pontamine Diazo Scarlet 2BL, produces brilliant scarlets considerably bluer than those obtained with Pontamine Diazo Scarlet A or Diazo Scarlet R.

It is level dyeing, according to the announcement, possessing good solubility and very good working qualities. It can therefore be used on any type of machine usually employed for this class of dyes. Its fastness to acids, alkalies, cross-dyeing, perspiration and washing is described as good, and the light fastnes as good as the average diazo color. It discharges to a clear white with Sulfoxite C and is therefore suitable as a ground for discharge work, like the other diazos in this series. It is said, furthermore, to give brilliant shades on silk, a vivid scarlet being produced which is yellower than those on cotton. On silk its fastness to water and washing is claimed to be good. Celanese is left unstained.

NEW CARD SHOWS FAST WOOL COLORS

Ten shades of eight different colors for use on woolen and worsted where good fastness is the requirement are displayed in a new color card issued by Bachmeier & Co., Inc., New York City. The series is given the name "Quintose Fast Colors." The card contains swatches showing various tones of Quintose Fast Rubinole, Fast Green, Fast Gray, Fast Blue B, Fast Brown R, Fast Brown Y, Fast Yellow 3G and Fast Blue R.

GARVAN CONGRATULATED BY S. O. C. M. A. FOR AIDING CHEMICAL INDUSTRY

At the October luncheon meeting of the Synthetic Organic Chemical Manufacturers' Association the following resolution was adopted unanimously by the members as a result of the recent Supreme Court decision against the Government in its suit to recover the patents held by the Chemical Foundation:

"Be It Resolved, That we extend to Hon. Francis P. Garvan, the President, and to the other officers of the Chemical Foundation, Inc., our sincerest congratulations upon the complete settlement of this suit and record here our appreciation of the debt of gratitude owed by our industry to the foresight of those who conceived this unique method of righting a wrong against our entire patent system and of making the way open for the development of a synthetic organic chemical industry in this country."

President Herty called attention of members to several matters of mutual interest, among them being the article in the recent issue of the Dearborn Independent by Dr. William J. Hale of the National Rsearch Council, entitled "Farming Must Become a Chemical Industry. Development of Co-Products Will Solve Present Agricultural Problem."

Attention was also called to the program of the Dye Division of the American Chemical Society at the recent meeting in Philadelphia. The newly elected officers of this division are: M. L. Crossley, chairman (Calco Chemical Company; E. K. Bolton, vice-chairman (Du Pont Company); H. T. Herrick, secretary-treasurer (Color Laboratory, Bureau of Chemistry); Wm. M. Scott, executive committee (Cheney Brothers); C. G. Derick, executive committee (Gary & Chesterton Chemical Company).

Technical Notes from Foreign Sources

Steaming Apparatus for Dyeing Printed Fabrics

The steaming apparatus employed up to the present time have been suited, for the most part, for the steaming or hot-pressing of cloth. The invention described in detail in German Patent No. 425,165 refers to a steaming apparatus which can also be used for fixing purposes. To this end the container which holds the cloth to be steamed is provided with a central perforated tube which also serves for the winding of the cloth. This centrally located perforated tube is provided with flanges on top and at the bottom which distribute the steam radially over the cloth that is wound around the tube. In this manner every portion of the fabric is thoroughly and uniformly steamed.

The Sulphur Chamber and Its Application

The sulphur chamber must be built in such a fashion that the sulphur gases are prevented from escaping to the outside atmosphere. The cover of the chamber is advantageously made in a concave shape. The sulphurous acid is produced externally of the chamber. The chamber is best installed in the first floor of the building in which it is used. In the courtyard of the factory, on a level piece of ground, it is advantageous to erect the sulphur burners in which the sulphurous gases are produced. An earthenware pipe then leads the sulphur gases through a water box, also located in the yard. The gases are passed through a stream of flowing water in order to remove the sulphuric acid in the sulphur dioxide gases. At the highest part of the water washer and on the other side from the entrance pipe there is located another earthenware pipe for exit purposes. The purified sulphurous acid gas flows through this line into the top of the sulphur chamber. A piece of cloth is inserted in the pipe near the outlet end at the washer through which the gas passes, with the result that impurities in the gas are held back by the cloth.

A number of relief pipes are attached to the sulphur chamber, and these are allowed to remain open until gas is found to emerge. These pipes are located at the bottom of the chamber and the gas is allowed to enter only after the cloth has been inserted and the doors have been closed. The powerful suction effect obtained in this manner serves to give the gas a certain amount of pressure. This results in the cloth being thoroughly and uniformly impregnated with the gases.

The best bleaching action is obtained at a temperature of 20 to 25 deg. Cent., and this is attained in the sulphur chambers when the pipe leading from the sulphur burners to the roof of the chamber is well insulated. When the sulphur gases begin to flow out of the relief ports, then they are closed and the sulphur dioxide is allowed to exert its action on the goods over a period of twelve to twenty-four hours. Then the goods are removed, washed, acidified, blued, centrifuged and dried. (Deutsche Faerber Zeitung, 1926, page 823.)

Vat Dyes on Wool

The vat dyestuffs which have an affinity for the wool fiber are constantly assuming greater importance, especially in the case where they can be dyed from weakly alkaline liquors. These colors have the advantage in that the amount of steam required is small, less time is required for the dyeing, and the physical properties of the woolen fiber are better maintained in their optimum condition than when the material is subjected to prolonged boiling in the chrome process so as to produce a fast shade according to the customary dyeing method.

The essential characteristics of the methods used for dyeing wool with Indigo and vat colors are the prevention of the precipitation of the acid from the leuco compound by the introduction of a protective colloid, the prevention of the solution becoming alkaline directly previous to the dyeing or during the process by the addition of acids or acid salts, and finally the neutralization of the liquor by means of an ammonium salt. The neutralization of the solution results in producing a greater affinity in the leuco compound for the fiber, and thus a better exhaustion of the color liquor. Mention must also be made of the fact that when wool is being dyed in the loose condition, the wool must be immediately rid of the excess liquor after it is taken out of the vat. This condition applies as well, but in modified form, to other forms of wool, and this therefore means that good results are dependent to a large degree on the way in which the material is mechanically handled.

An interesting method for using these dyes on wool in any type of present extant dyeing machines has just been published. The vat is prepared with the addition of the required proportions of glue, ammonia or soda, hydrosulphite and the dye solution. The dyeing begins at a temperature of 50 deg. Cent. and the dye liquor is permitted to circulate through the textile material for approximately twenty minutes. Thereafter a sufficient amount of ammonium chloride is added so that it can react with the fixed alkali. After an additional ten minutes the necessary proportion of acid or acid salt is added so as to liberate the ammonia, and thereafter the bath is kept in circulation for an additional fifteen minutes, whereat the dyeing process is completed. Then the dye liquor is pumped out of the

dyeing machine and water is added. The material is then lifted out, centrifuged and oxidized.

The advantages which are possessed by this method are as follows: It makes possible, in the first place, the production of light to dark, even black, shades in a single bath—shades which are fast to fulling. It enables the saving of a considerable amount of color, due to the almost complete exhaustion of the vat liquor. The extent to which the color is removed from the liquor is so great that a laboratory test with a few grams of material could be applied without any further addition to a quantity of 100 or 200 kilograms of wool. A further advantage of the process is that the vat dyestuffs can be employed in the dyeing of wool just as well in an open vat as in a dyeing machine.

The following example shows clearly the various proportions employed in the process. It is concerned with the dyeing of a green shade on wool in an open vat. For every 100 kilograms of wool the following materials are added to 300 liters of water at a temperature of 50 deg. Cent.: 0.5 per cent of glue, 2 per cent of ammonia, the same percentage of hydrosulphite and also of dyestuff (in this case the color is dichloroanilidobenzoquinone), and 5.5 per cent of a 20 per cent reduced Indigo paste. The dyeing is carried out with constant movement of the goods over a period of twenty minutes. Thereafter from 2 to 3 per cent of ammonium sulphate is added to the liquor and the dyeing is prolonged for another twenty minutes. The liquor is then exhausted, and after from 3 to 4 per cent of acetic acid has been added the dyeing is prolonged for another fifteen minutes. After the dye liquor is allowed to run out of the vat the wool is washed, centrifuged and oxidized. (Deutsche Faerber Zeitung, 1926, pages 823-4.)

Weighting of Silk

The X-ray examination of silk fibers weighted with various materials, such as tin phosphate and waterglass, shows interference rings superimposed upon the original point pattern of the silk itself, where the silk diagram is obscured owing to separation of amorphous material. This shows that there is no chemical combination between the weighting material and the silk substance itself. Probably the weighting material, which takes a crystalline form, penetrates into the intercellular spaces of the fiber and is fixed by the degradation products of the fibrous material. (Zeitschrift fuer angewandte Chemie, 1926, Vol. 39, pages 380-1.)

Conditioning of Raw Cotton Stock

The production of static electricity during the working up of raw cotton stock is minimized by treating the stock, either in bulk or before the completion of the drawing operation, with not more than 4 per cent, and preferably not less than ½ per cent (figured on the weight of the cotton), of a non-volatile, stable oil. The most satisfactory results are obtained with a pure mineral oil which has a viscosity of between 25 seconds Saybolt at a temperature of 21 deg. Cent. and 300 seconds Saybolt at a temperature of 100 deg. Cent. and density between 0.8 and 0.966. The oil may be removed from the finished material by the use of suitable emulsifying agents. (British Patent No. 242,593.)

Action of Sodium Sulphide on Linen Fibers

A comparison of the purifying action of boiling solutions of sodium sulphide and sodium hydroxide on raw linen yarns containing 83.8 per cent of pure cellulose is described in an article published in Melliand's Textilberichte, 1926, Vol. 7, pages 61-63 and 444-445.

Raw linen yarns digested with boiling water and a solution containing 10 per cent (calculated on the weight of the yarn) of sodium sulphide suffered a loss of 3.8 and 6.4 per cent respectively. Solutions of sodium hydroxide effect the removal of impurities (pectic and other incrustating substances) from raw linen more rapidly than solutions of sodium sulphide of equal concentration (calculated on the weight of the linen), but solutions of sodium hydroxide produce greater deterioration of linen, especially when used for prolonged periods at high temperatures. The luster, handle and whiteness of bleached linen yarns previously scoured with sodium sulphide are not inferior to those of similar yarns previously scoured with sodium hydroxide.

Aktivin in Textile Printing

The stability of Aktivin, which is sodium paratoluenesulphonchloramide, renders it more suitable than any other well-known oxidizing or bleaching agents for the treatment of fabric either before or after printing. For example, the chlorination of woolen fabrics before printing is satisfactorily replaced by treatment for a period of twenty to thirty minutes in a cold solution containing per liter 1 gram of Aktivin and 5 c.c.. of hydrochloric acid of 21 deg. Be. (density 1.17), the fabric being subsequently treated with an "antichlor"; for example, a one solution of sodium thiosulphate.

For clearing the whites of printed goods, treatment with a solution containing per liter 0.2 gram of Aktivin and 0.2 gram of formic acid (for fabrics printed with basic colors and other dyes sensitive to chlorine) or 1 gram of Aktivin and 0.5 gram of formic acid or 0.6 gram of hydrochloric acid of 1.17 density (for fabrics printed with fast vat dyes) is satisfactory.

Aktivin is suitable for the preparation of starch pastes for thickening printing pastes. A satisfactory paste is obtained by heating 2 kilograms of potato starch, 15 grams of Aktivin and 20 liters of water for ten to fifteen minutes, and adding to the product half its weight of a 7 per cent solution of gum tragacanth. Colored effects obtained by printing with vat dyes may frequently be improved by aftertreatment with a warm

solution containing, per 200 liters, 100 grams of Aktivin and the same amount of an 80 per cent solution of formic acid. The treatment lasts for ten minutes. The use of standing baths containing Aktivin is possible.

GERMAN DYE TRUST TO STORE DYES IN RUSSIA

The I. G. Farbenindustrie will establish warehouses at Leningrad, Kharkov and Moscow for large stocks of dyestuffs and rayon chemicals, according to a recent cable from Berlin. This move follows an agreement between the Soviet Union and the I. G.

There will, it is said, be a complete reorganization of the Soviet chemical industry, which will involve a thorough factory course for Russian engineers and chemists.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1924, OF AMERICAN DYESTUFF REPORTER.

Published biweekly at New York, N. Y., for October 1, 1926.

State of New York, County of New York, s.s.:

Before me, a notary public in and for the State and county aforesaid, personally appeared Alfred P. Howes, who, having been duly sworn according to law, deposes and says that he is the publisher of the American Dyestuff Reporter, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 445, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

Publisher—Alfred P. Howes, 90 William Street, New York City. Editor—Louis A. Olney, Lowell, Mass. Managing Editor—Clayton Hoagland, 90 William Street, New Yo.k City. Business Manager—Alfred P. Howes, 90 William Street, New York City.

2. That the owner is: Howes Publishing Company, Inc., 90 William Street, New York City: J. T. Howes, Rutherford, N. J.; Louis A. Olney, Lowell, Mass.; Alfred P. Howes, 90 William Street, New York City; Derfla H. Collins, Upper Montclair, N. J.; Mary K. Howes, Northampton, Mass.; N. H. Hiller, Carbondale, Pa.; William F. Collins, Upper Montclair, N. J.; Joseph L. Schroeder, Hartsdale, N. Y.; William H. Collins, Upper Montclair, N. J.; D. C. Howes, Rutherford, N. J.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest, direct or indirect, in the said stock, bonds or other securities than as so stated by him.

Alfred P. Howes, Publisher.

Sworn to and subscribed before me this 29th day of September, 1926.

[Seal] Caroline Essenbreis.

(My commission expires March 30, 1927.)

SPLENDID OPPORTUNITY

Owner of half interest in old established operating cotton dyehouse in Philadelphia, moving away; will dispose of his interest to one or two capable men. Write and express ideas if interested and owner will reciprocate. Room for supervision as well as investment. Address Box 354, American Dyestuff Reporter.

DYE WORKS MANAGER

Dye works manager, at present managing large works in Britain doing almost exclusively vat colors on piece goods, yarns and artificial silk, wishes to enter first-class works in U. S. A. in similar capacity. Advertiser is 43 years of age, had first-class chemical training on Continent and is considered an expert in the application, and also manufacture, of vat colors. He has had exceptional experience in the designing and erecting of works and plants; is capable of handling large numbers of men and to take sole charge of a big concern. Firms requiring a real live wire and first-class organizer please communicate in the first place. Address Box 356, American Dyestuff Reporter.

EXPERIENCED DYER

American, 31 years of age, married, at present employed by nationally known hosiery mill as overseer of dyeing, desires position with progressive hosiery concern. Technical education. Over ten years' experience on full-fashioned, ladies' seamless and better class of men's hosiery. Thoroughly experienced in the dyeing and bleaching of wool, cotton, silk, rayon and Celanese; yarn and garments, in solid shades and multicolor effects. Gladly furnish references and interview. Reply, Box 360, American Dyestuff Reporter.

UNUSUAL OPPORTUNITY

We have an attractive proposition for a result producer to promote the sale of our complete line of chemical textile specialties, such as Sulphonated Oils, Finishes, Softeners, etc., in Rhode Island and Connecticut. Only those fully qualified and who know how to produce need apply. All replies strictly confidential. Our organization knows of this advertisement. Reply, Box 361, American Dyestuff Reporter.

RESEARCH WORKER

Wanted—Textile man with good chemical knowledge, preferably with some practical experience, for laboratory and research work near Philadelphia. In applying please state fully training, experience, references and salary required. Reply, Box 362, American Dyestuff Reporter.

FOR SALE

Old-established operating hosiery dye works in eastern Pennsylvania. Four hosiery mills in town; serves three mills; no other dye works in town. Good opportunity. Reply, Box 363, American Dyestuff Reporter.

Proved! Monel Metal's Cleanability Increases Production and Cuts Costs

"Onyx" Hosiery Inc.

NEW YORK OFFICE
1107 BROADWAY

WHARTON, N. J.
August 13, 1926.

The International Nickel Co.,
67 Wall Street,
New York City.

Dear Sirs;

You may be interested in knowing that our present dyehouse, which has been in operation about eighteen months, is equipped throughout with Smith, Drum and Company Monel Metal rotary dyeing machines, and Smith, Drum and Company paddle machines, the paddles and linings of which are Monel Metal.

When compared with other metals such as Copper, etc., we find the qualities of Monel Metal to be best adapted to our uses, in the matter of production, efficiency and maintenance cost.

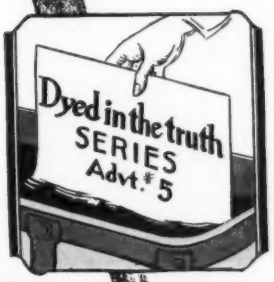
The many shades which now prevail cause a great many changes in the dye liquors, which are facilitated by the ease with which Monel Metal can be cleaned. This helps to increase our production and keep down the labor cost.

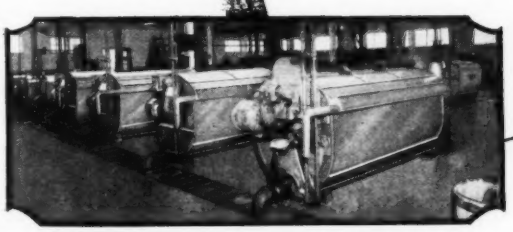
We find that our dyestuffs, which consist of Developed Blacks, Direct Colors, and Neutral Dyeing Acid Colors, have no perceptible effect on the metal, nor do we have any trouble in our methods, coming from any slight reaction which might take place between the Monel Metal and the acids used.

The good wearing qualities of Monel Metal, and its ability to withstand the action of dyestuffs and chemicals, give it a decided advantage over other materials in the matter of repairs or maintenance.

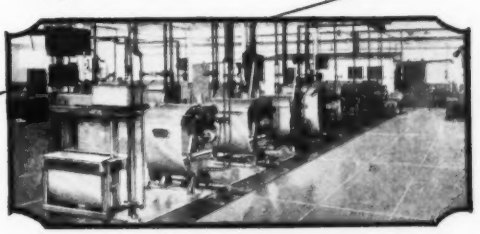
We also use your product in the form of dyepails, buckets, strainers, etc., with the same good results, and we are now considering the using of Monel Metal lined tubs for our soaking bath in our Throwing Plant.

Very truly yours,
"ONYX" HOSIERY INC.
Per J. Burnett Cooper





View of new dye house of "Onyx" Hosiery, Inc., Wharton, N. J. showing some of the 16 all Monel Metal Rotary Hosiery Dyeing Machines, manufactured by SMITH-DRUM & CO. OF PHILADELPHIA, PA.



Another view of "Onyx" dye house showing additional Smith-Drum Monel Metal Rotary Dyeing Machines ranging in capacity from 10 lbs. to 300 lbs. per batch.

INCO MONEL METAL TRADE MARK — **Monel metal** — INCO MONEL METAL TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, 67 WALL STREET, NEW YORK CITY

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Howes Publishing Company

90 William Street **New York City**

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in the English Language

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and
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PUBLISHED AND ISSUED BY

The Society of Dyers and Colourists

PEARL ASSURANCE BUILDINGS, BRADFORD, YORKS., ENGLAND

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"FOG"

The Enemy of Labor in Your Dyehouse

PROTECT your operatives from this constant menace. "Fog" not only causes a serious reduction in the efficiency of your dyehouse labor, but is also a constant menace to their safety. Impaired vision leads to accidents.

"Fog" in a raw wool dyehouse is no longer a necessary evil. Franklin Process Raw Stock Dyeing Machines will absolutely eliminate it, because they dye under pressure in *closed kiers.*

The steam that ordinarily escapes and causes rapid deterioration of the dyehouse and equipment is sealed in the Franklin Process closed kier, making it possible to operate at 25 to 30° lower temperature, and effecting an important saving in fuel and dyestuff.

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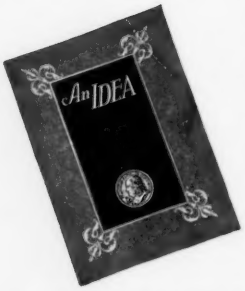
If you are not already acquainted with the many advantages of Franklin Process Raw Stock Dyeing Machines, you will find some interesting and valuable information in our booklet, "An Idea — And What Came of It." Send for a copy to-day.



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